# Ethical Praxis in Body Scanning:

## An Experimental Study into 3D laser Scanning in Fashion and Textiles/Surface Design

**CADE 2005 Post graduate research conference:**
held at the Watershed & hosted by The University of West England, Bristol:

March 23-24th 2005.

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# Overview of the presentation

- Background
- Introduction to experimental laser scan study
- 3D laser scanner + 3D software
- Ethical approach to scanning male and female bodies
- Pre-test methods
- Methods for 3D body scanning experiment
- Analysis of data
- Results + Conclusions

# Aim of the study:

# informed by review of literature

- **The aim of the study focuses on the evaluation and testing of the 3D scanner and 3D scanner software to understand the value and methods of integrating the 3D laser scanner with 3D CG/CAD software, to extend the research into the areas of wearable technologies.**

- **Section below from Literature Review in** Taylor, A. and Unver, E. (2005) '**An experimental study to test a 3D laser Scanner for body measurement and 3D virtual garment design in Fashion education**'. *In: Wearable Futures – Hybrid Culture in the Design and Development of Soft Technology*. : University of Wales. pp. 1-14. ISBN 978-1-899274-34-5**:**

- 3D fashion researchers at London College of Fashion are exploring collaborative interdisciplinary projects using 3D technologies and smart clothing/products. Marks (2005),University of the Arts (2005). Specific application of 3D body scanning as a tool for improved construction of smart clothing is described by Nam, et al; (2005). The group use a 3D body scanner to test the fit of Liquid Cooled vests currently worn by astronauts, firefighters, and pilots. The analysis of 3D scan data results will assist in the development of improved fitting functional garments, for a wider performance clothing market in the future.

# Objectives of the study

1. To evaluate 3D Laser scanner in fashion education

2. To body scan a sample group of students

3. To introduce ethical approaches to scanning bodies

4. To develop new methods for integrating 3D body data

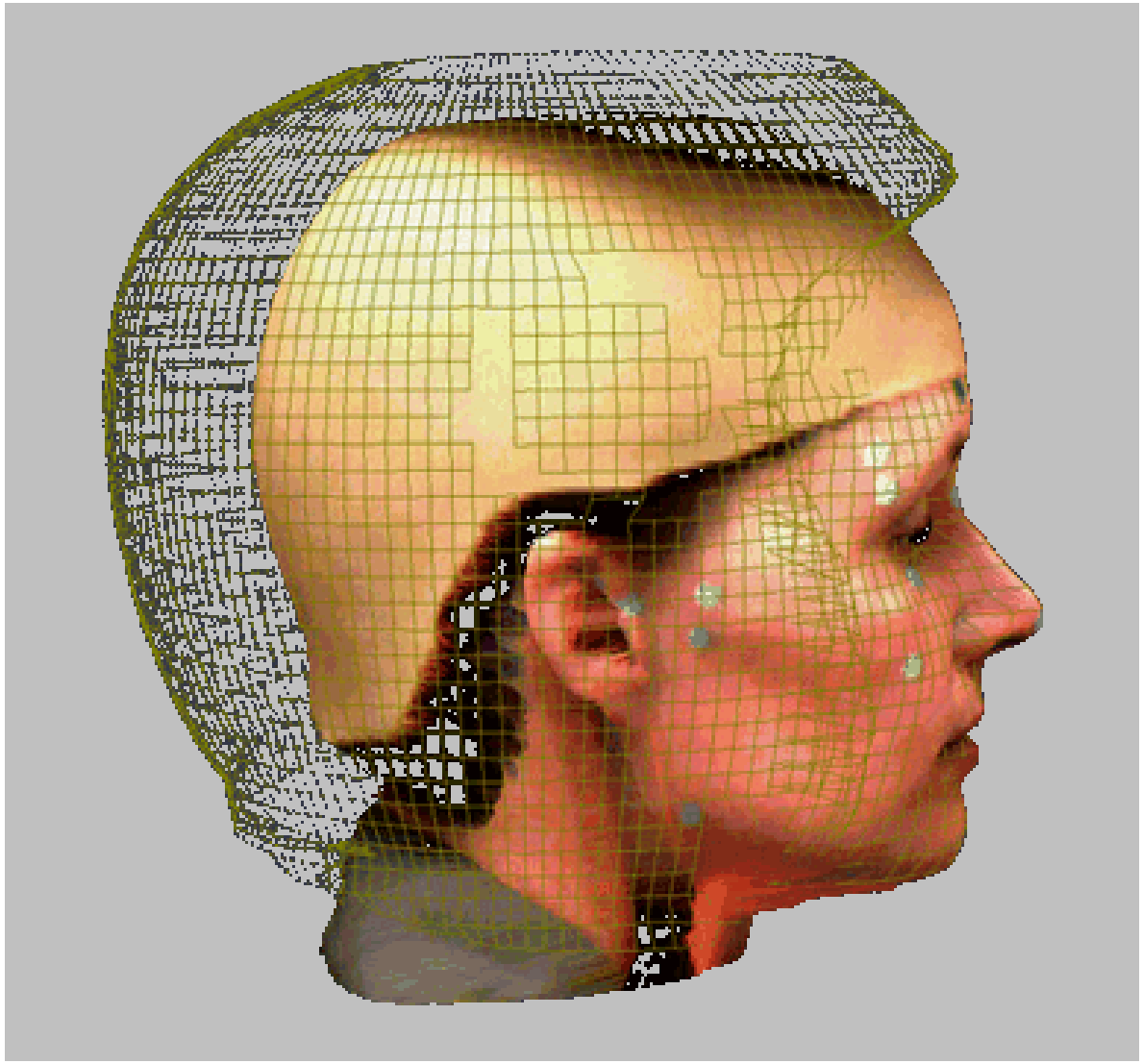
# **Future Prediction:**
# 3D Body Measurement Systems

- **“3D measurement systems will permit inversion of real objects back to CAD models, creating an explosion of custom fit, ergonomically optimised goods, exact replacement parts, and perfect replicas.”**
-

**Potel, M .2000;**

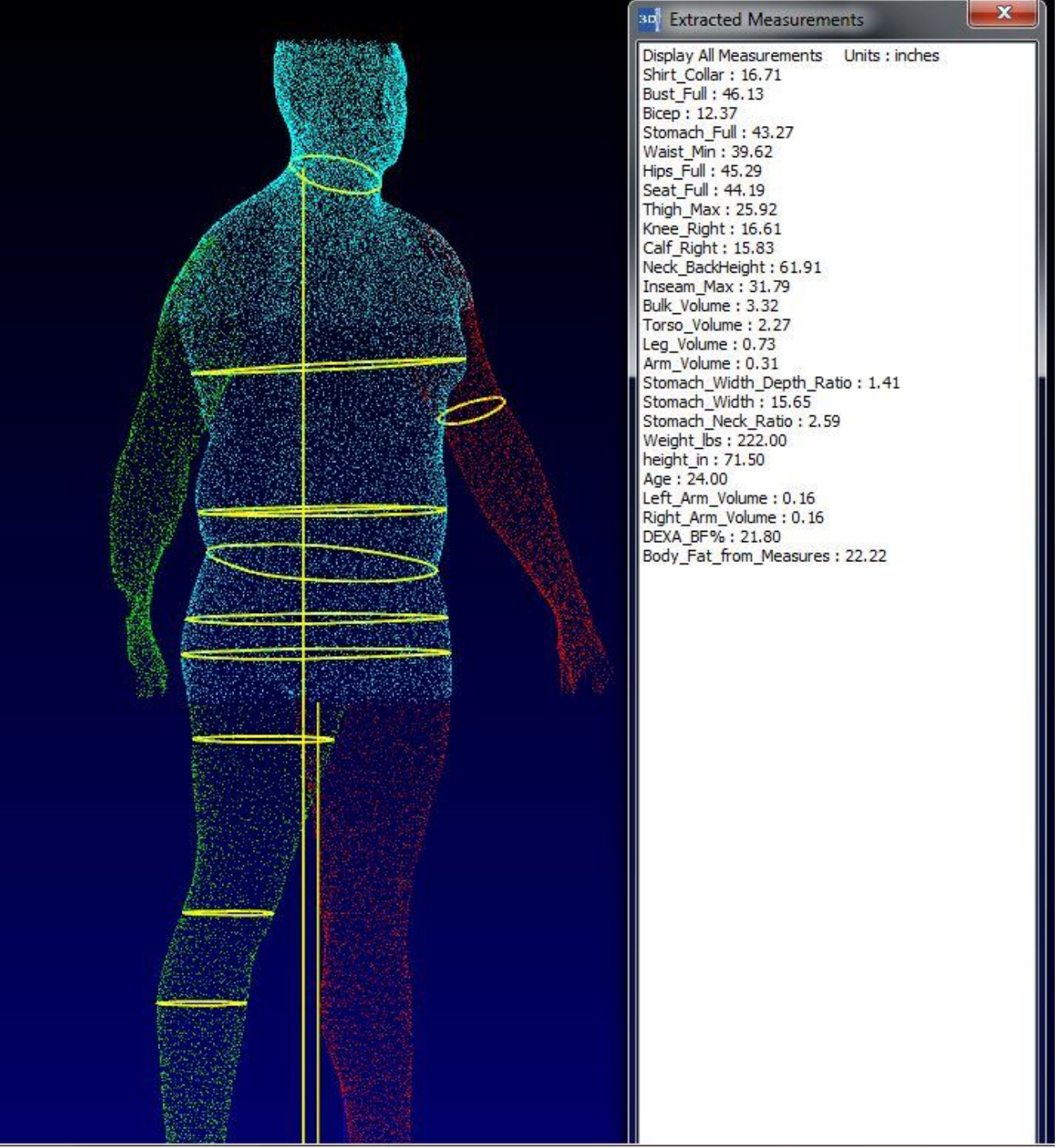
‘Applications 2000,’ in, *IEEE Computer Graphics and Applications.*

3D body Scanning and fit software
original research and developers of high performance fitted clothing
by government military research. **Ethical issues**.



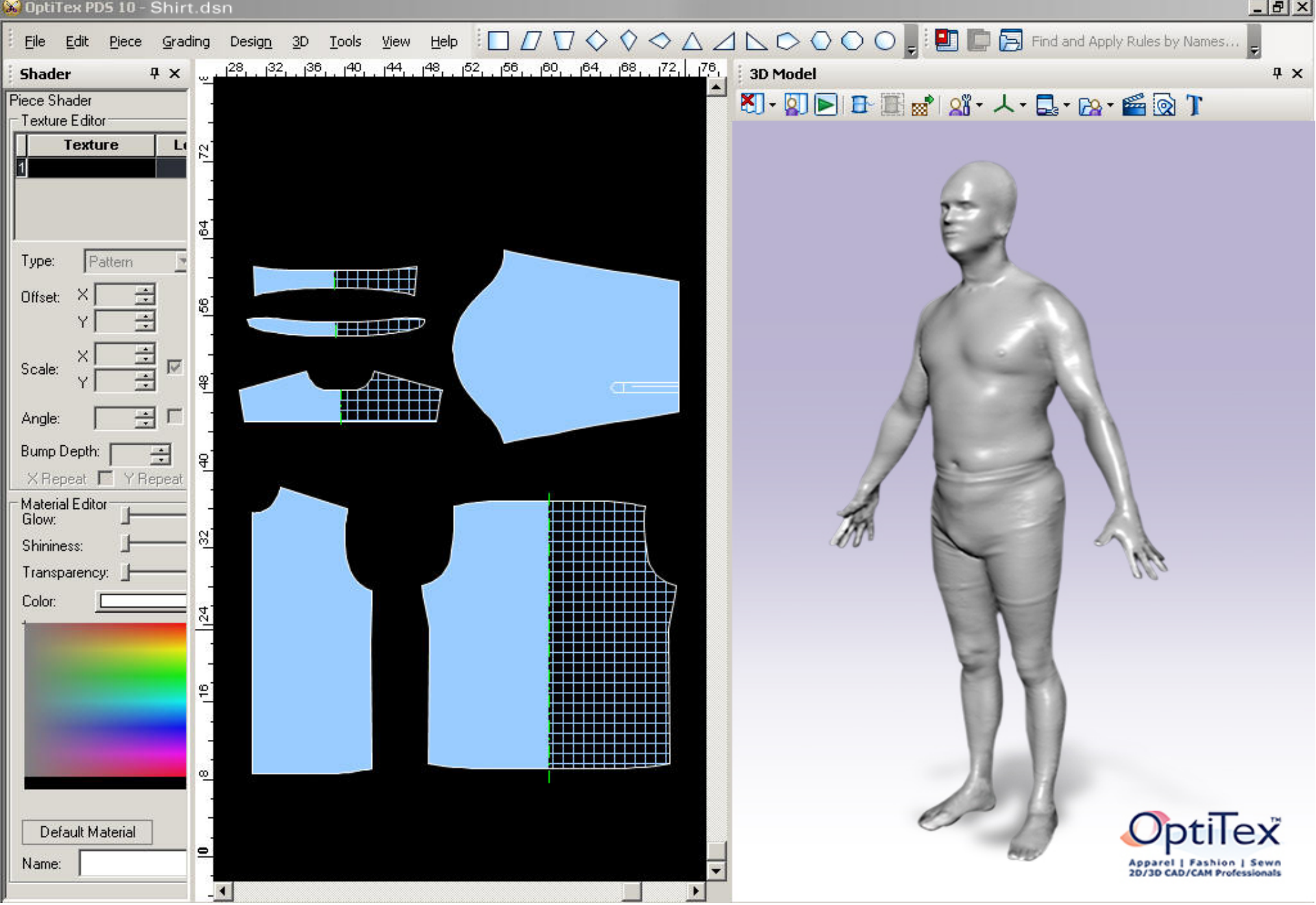
# 3D Whole Body Laser scanner & services:

Offers data protection, private changing and specialist service and body scan suits

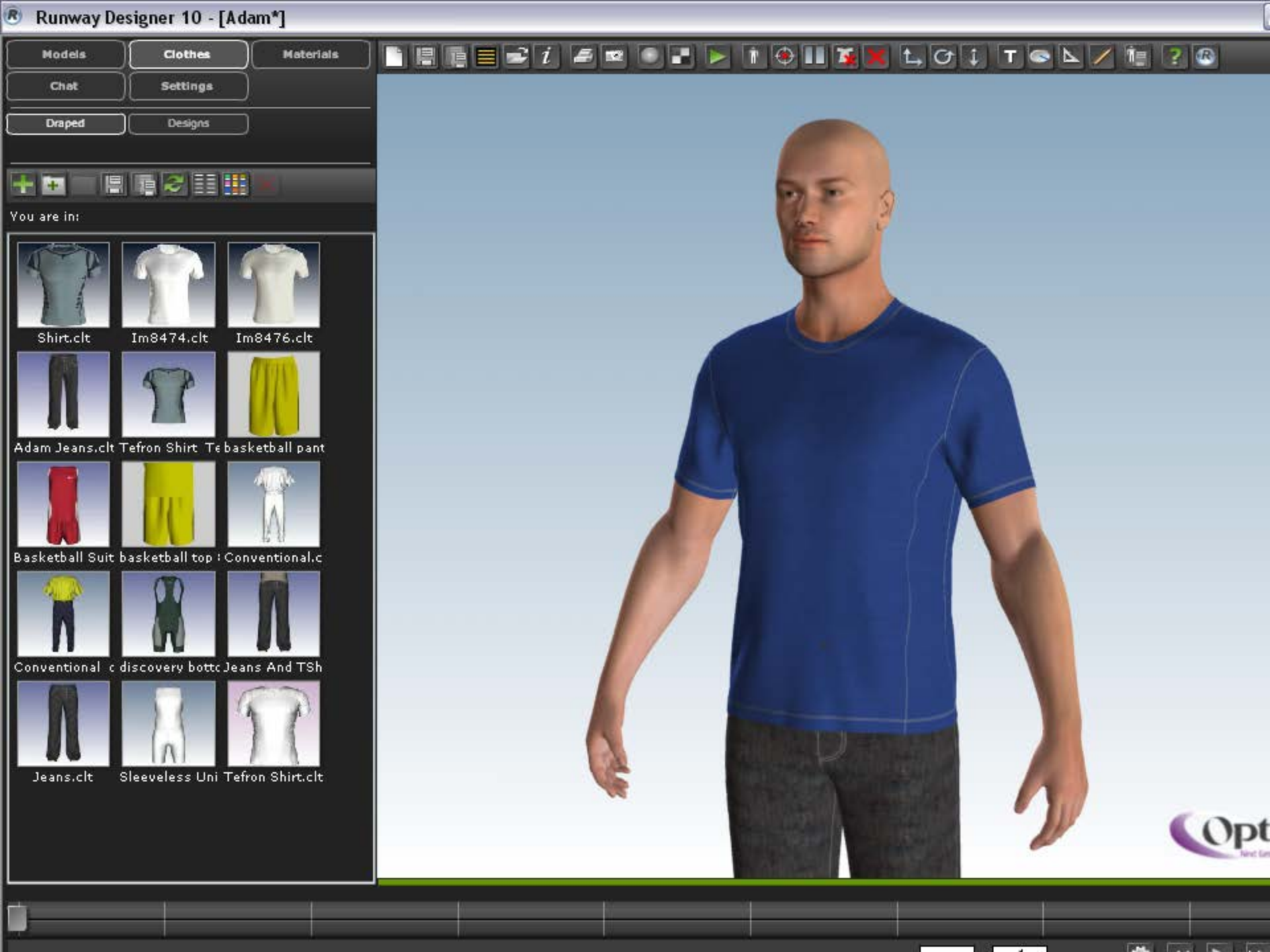



**New Results Indicate [TC]² 3D Body Scanning Measures have Very High Correlation to Body Fat Composition from DEXA Scanning**

By Dr. David Bruner, [TC]²
http://www.tc2.com/




Body scan data can be imported into OptiTex 3D for pattern design, textiles design visualisation.


Runway Designer 10 - [Adam*]
Models
Clothes
Materials
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Shirt.clt
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Jeans And TSh
Jeans.clt
Sleeveless Uni
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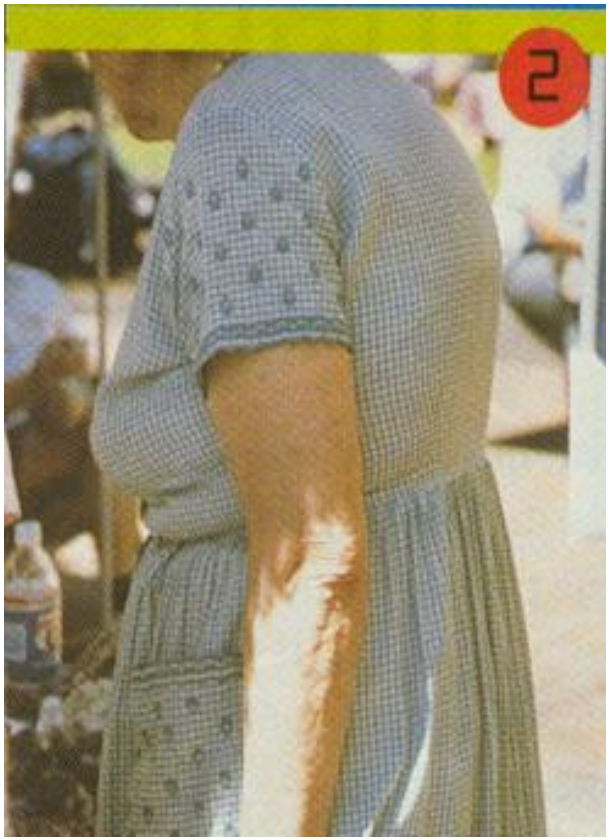
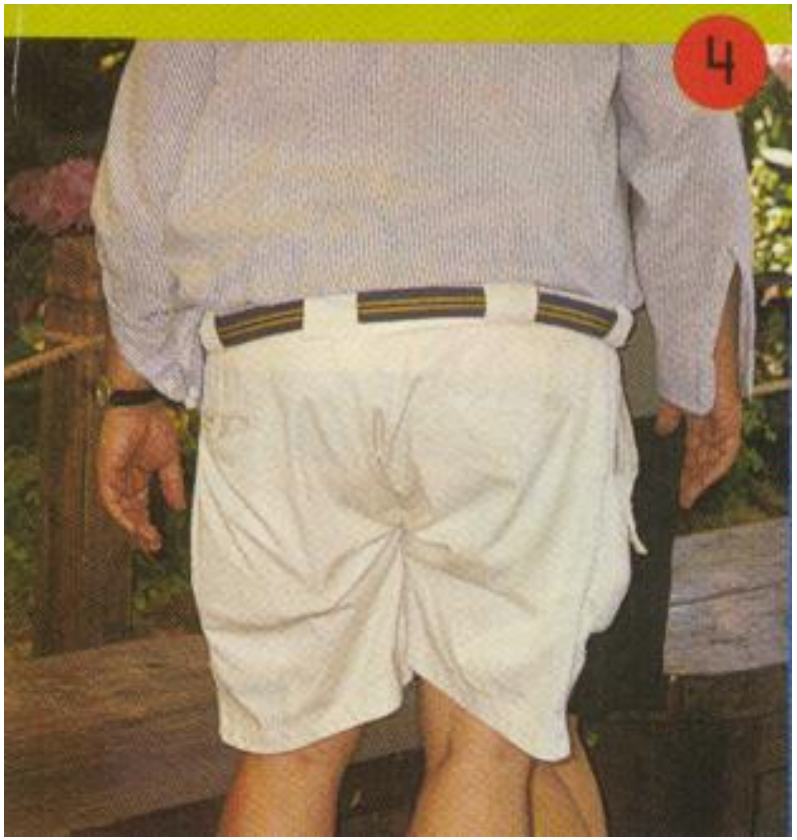
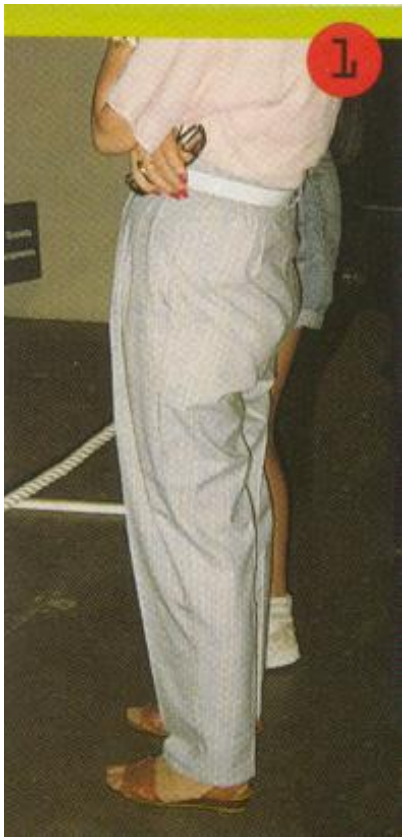
**high street retailers offer clothes in standard sizes:** s, M, L = 8, 10, 12 ,14, 16 …..

consumer often has difficulties with body awareness and finding clothes to fit well




“But now, U.S. shoppers can say goodbye to saggy behinds and waists that ride up, as Bodymetrics has made its way stateside, via a partnership with digital agency Razorfish and use of Microsoft's Kinect.”
By Shareen Pathak. Published on March 22, 2012

# 1st U.S. Bodymetrics Pod Brings Body Scanning Tech to Bloomingdale's

*Posted on August 13, 2012 by* ***Lorraine Sanders*** *in* ***Digital Style News***, ***Fitting Technology***, ***Shopping*** | ***1 Comment***

The U.S. Bodymetrics Pod, comes in two versions, one for the home and one for retail outlets, is a bit different from its U.K.counterpart.

Unlike the British pod, which uses a proprietary technology, the Stateside models use Kinect for Windows sensors to map your body's outline and find your "shape," which can be classified as "emerald," "ruby," or "sapphire."

An exact price point has not yet been decided by the company, but the metrics are "very good," for the retailer, said Bodymetrics CEO Suran Goonatilake.

Although Mr. Goonatilake could not disclose how many people currently have Bodymetrics profiles, privacy and data storage is a big issue for the company.

Customer data is stored on Microsoft's cloud storage platform Azure.

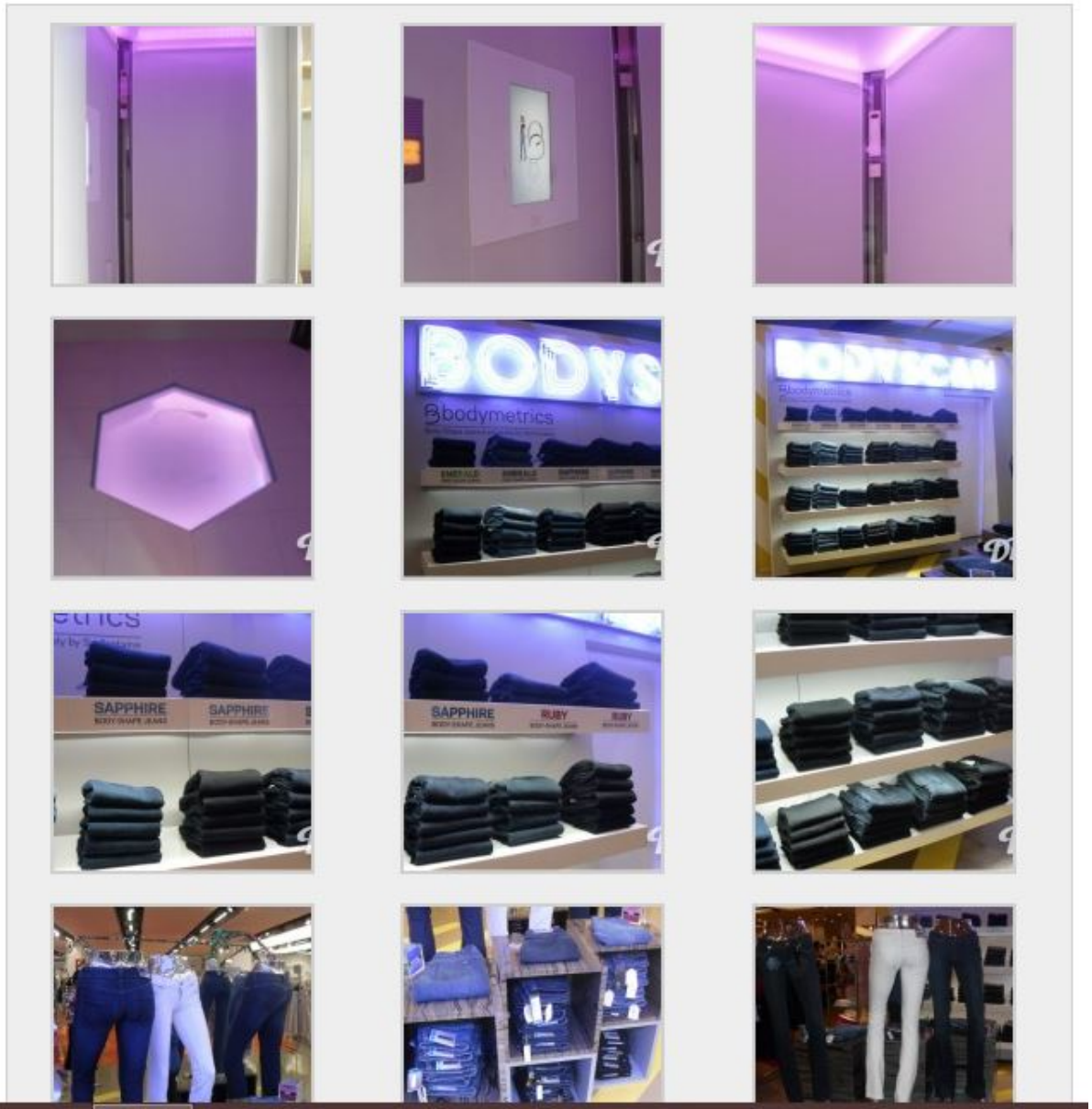
"Like any type of information, this is treated sensitively," said Mr. Goonatilake.

"We've made it clear that users are in full control of their data and what they choose to share. They can also delete it anytime.“

**Sourced:** http://adage.com/article/cat-creativity-and-technology/bodymetrics-razorfish-change-retail/233471/

If you are ever in London I would recommend trying it out, it's pretty fun! More will come soon when I review the jeans as soon as I can. I do have a couple of other reviews to do before so bare with me! Have any of you tried the Bodymetrics scanner before?

**You can now read my review on these jeans here.**




**Trying the Bodymetrics Scanner at Selfridges**

05.05.2011Posted in denimblogby Lorna, Editor

The staff in Selfridges are absolutely wonderful and they help you with everything as well as make you feel comfortable, just in case you are put off by the process because you do have to undress down to your underwear, but you do that in private.

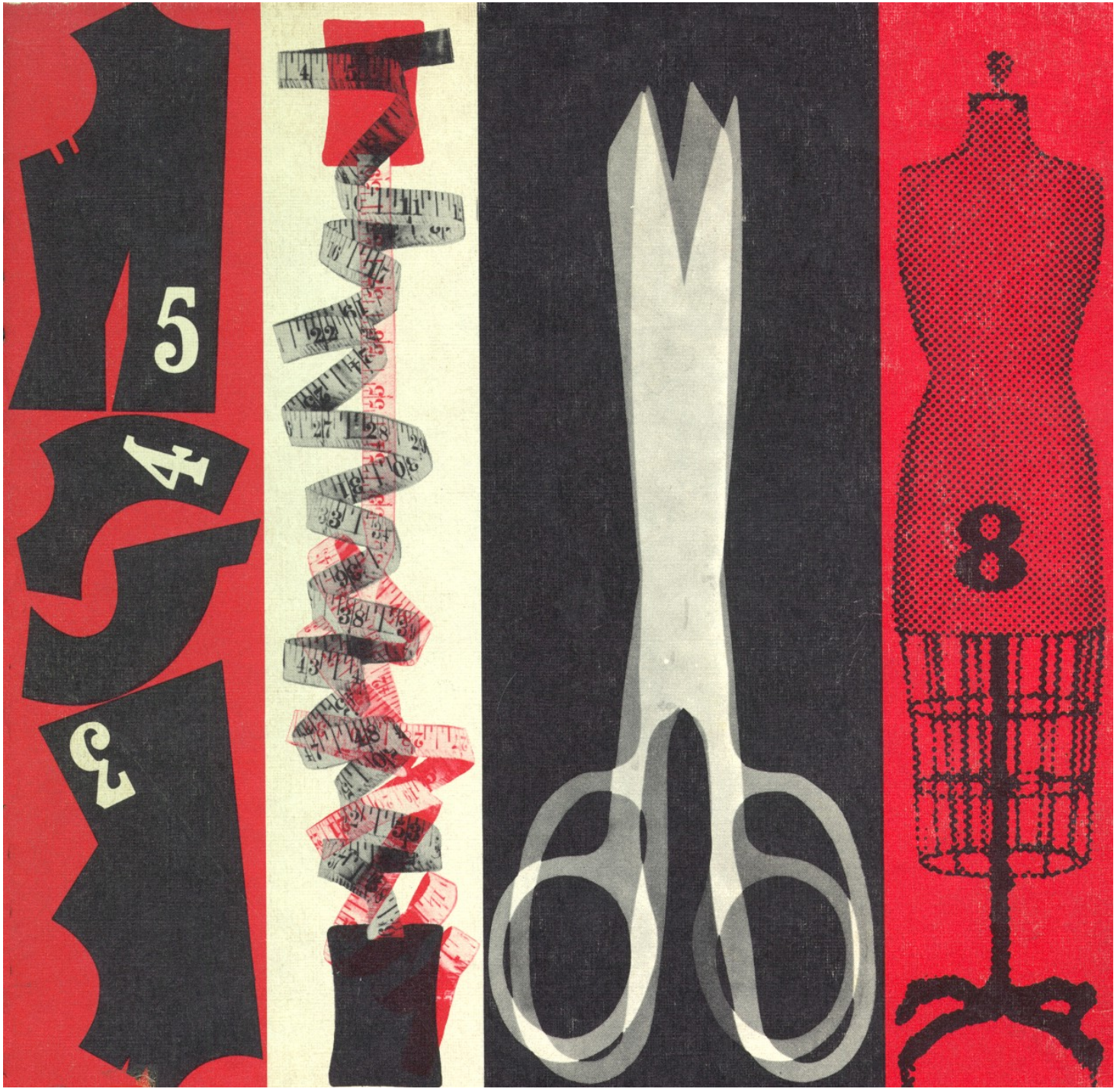
Once you are in your underwear, make sure it's a lighter colour as black doesn't show up, you stand in the machine (you can see the images in the gallery of the scanner) and you place your feet on the markers provided and stand with your arms out to the side.

Once you are ready, you press the button and the beams will come down to the ground and back up again. It only takes about 5-8 seconds so it's a really quick process and you don't feel anything.

Once you have been scanned it sends a graphic style image to the computer which shows a model of your body in 3D but in grey scale, don't worry, it's not a real photo of you in your underwear, ha ha.

It also provides your measurements, however I think they are a little bit off, I've measured myself before, accurately with a tape measure and the Bodymetrics come out different, it said I had a 28″ inseam but I don't, I actually have a 30″ inseam. That may be due to standing with your legs quite far apart though, I'm not sure.

http://www.denimblog.com/2011/05/trying-the-bodymetrics-scanner-at-selfridges/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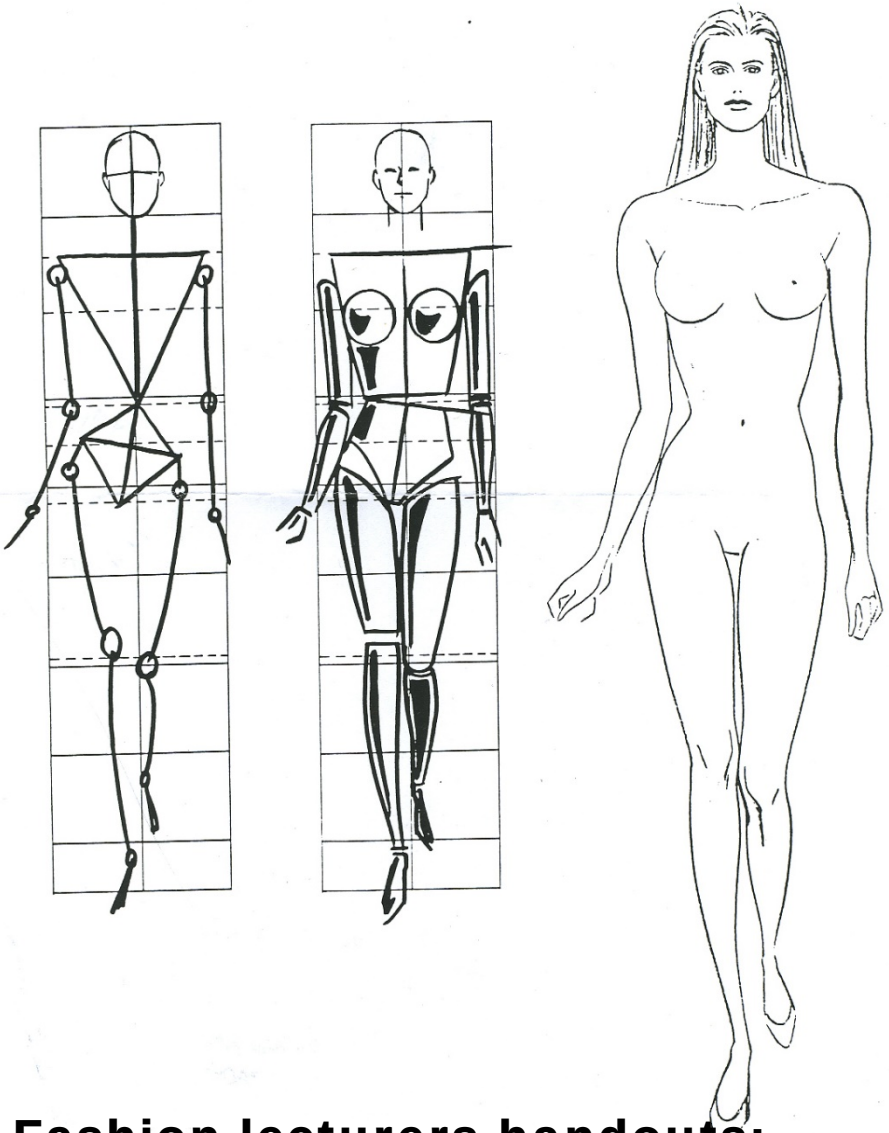
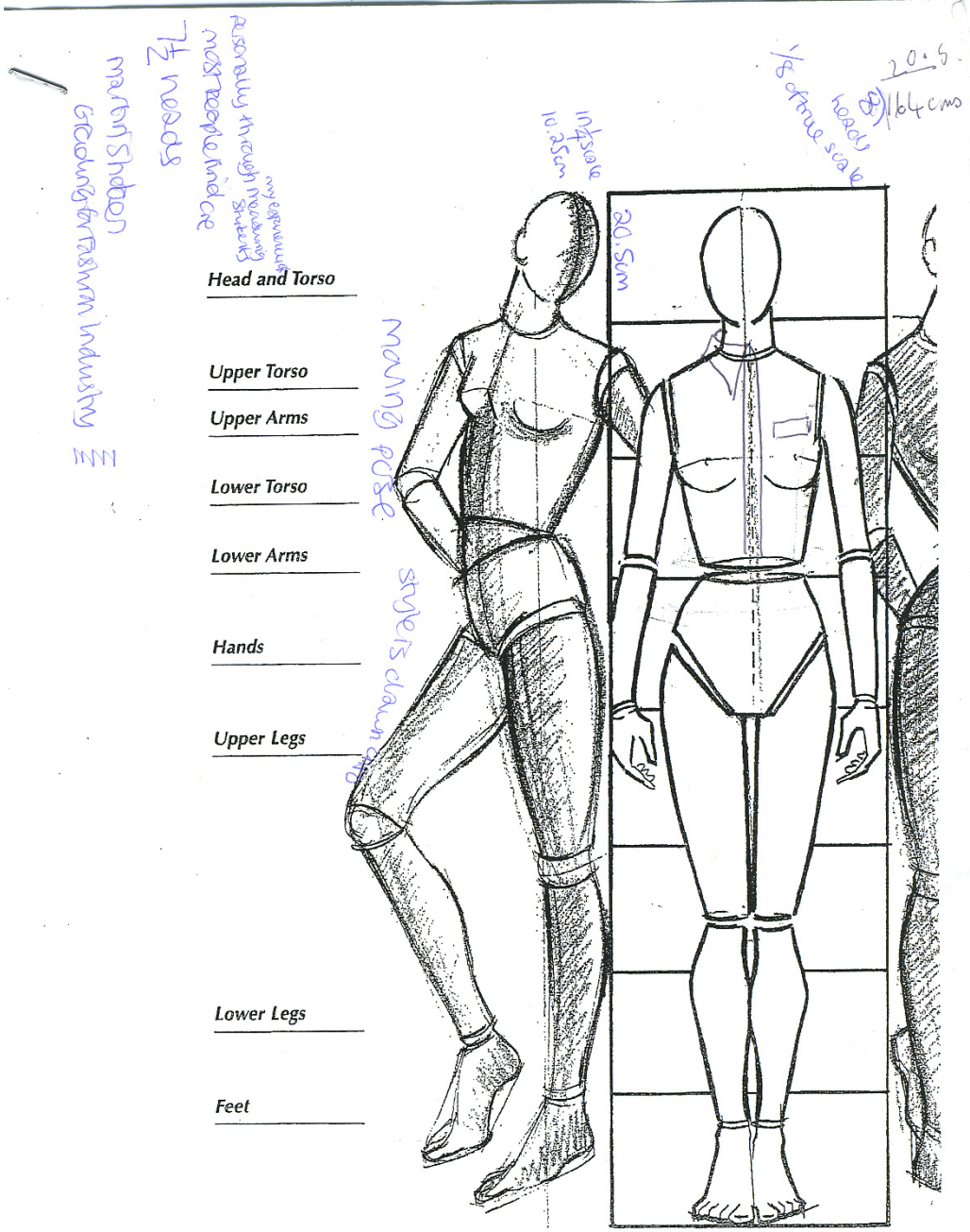
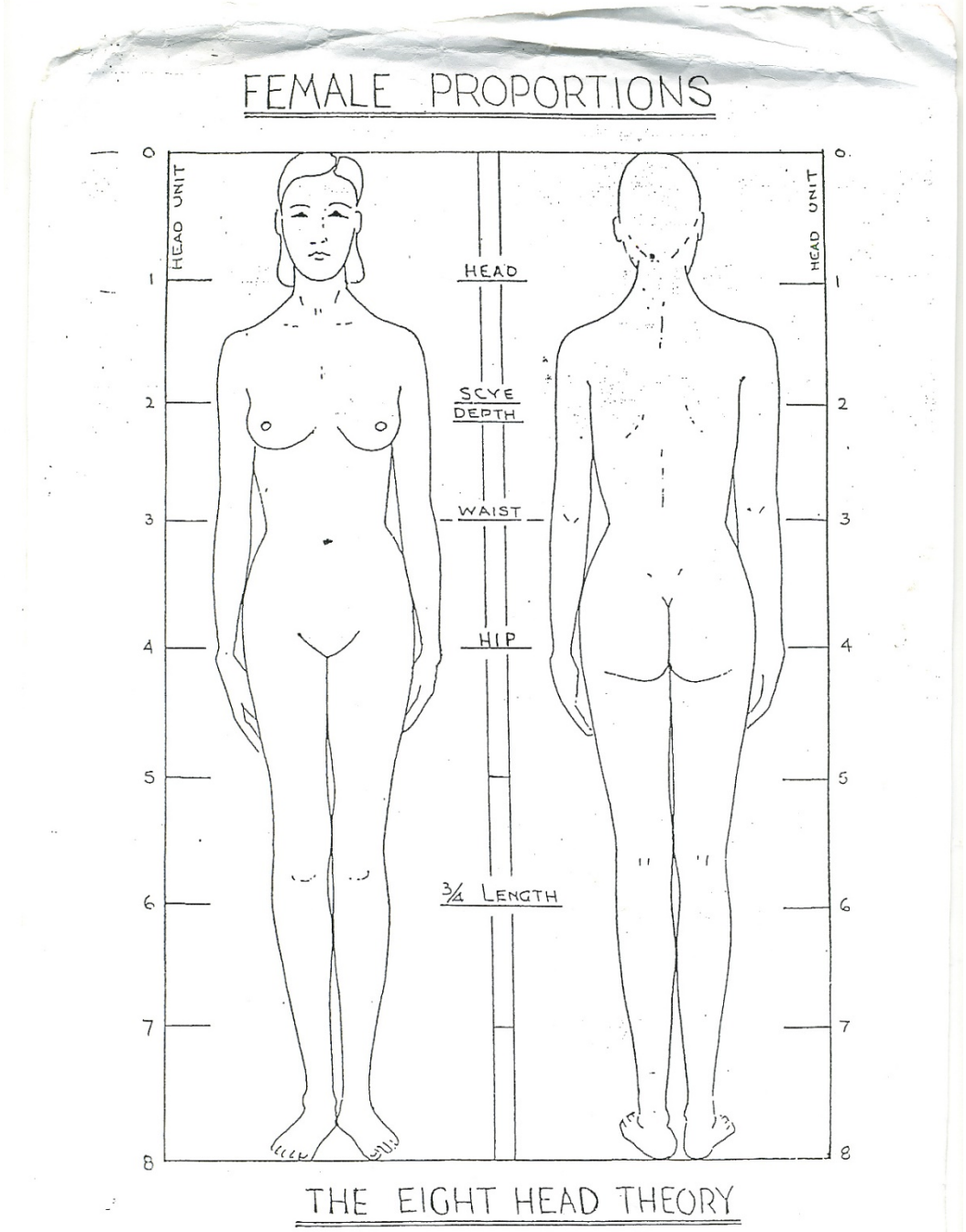


**Photocopies of Fashion lecturers handouts:**
Sourced from UK Fashion design courses



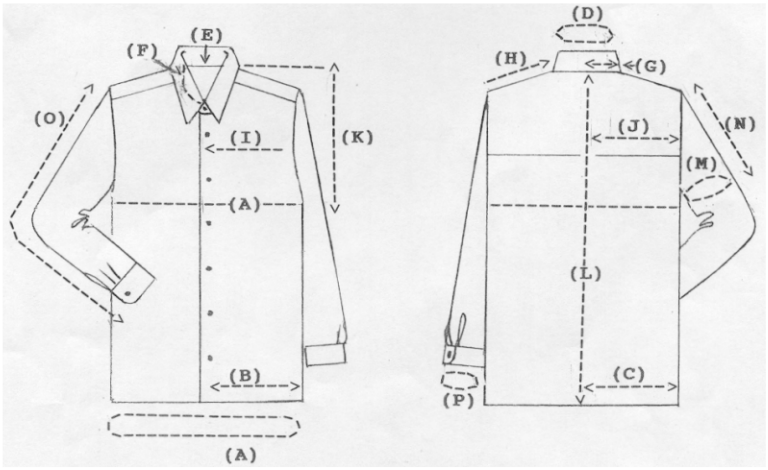

**Photocopies of Fashion lecturers handouts:** Sourced from UK Fashion design courses with researchers notes recorded from conversations with academics




**Photocopied Fashion Handouts:** Sourced from UK Fashion design courses

**SIZES**

| | To Fit Chest | 90 cm / 36" | 95 cm / 38" | 100 cm / 40" | 105 cm / 42" | 110 cm / 44" | 5 cm / 2" |
|---|---|---|---|---|---|---|---|
| | To Fit Neck | 14.5" | 15" | 15.5" | 16" | 16.5" | 0.5" |
| A | Full Chest & Hips | 106 | 111 | 116 | 121 | 126 | 5cm |
| B | Half front chest/Hip | 26 | 27.5 | 29 | 30.5 | 32 | 1.5 |
| C | Half back chest/Hip | 27 | 28 | 29 | 30 | 31 | 1.0 |
| D | neck buttoned | 40 | 41.5 | 43 | 44.5 | 46 | 1.5 |
| E | Neck Line | 41 | 42.5 | 44 | 45.5 | 47 | 1.5 |
| F | Half front neckline | 13.6 | 14.0 | 14.5 | 15 | 15.4 | 0.45 |
| G | Half back neckline | 6.9 | 7.2 | 7.5 | 7.8 | 8.1 | 0.3 |
| H | Dropped Shoulder | 19.4 | 19.7 | 20 | 20.3 | 20.6 | 0.3 |
| I | Half Cross Front | 22.5 | 23.5 | 24.5 | 25 | 26.5 | 1.0 |
| J | Half Across Back | 25 | 23.5 | 26 | 26.5 | 27 | 0.5 |
| K | Scye Depth | 28.6 | 29.6 | 30.5 | 31.6 | 32.6 | 1.0 |
| L | Length | 77 | 79 | 81 | 83 | 85 | 2.0 |
| M | Upper Arm | 44 | 46 | 48 | 50 | 52 | 2.0 |
| N | Slv. head depth | 8.5 | 9.5 | 10.5 | 11.5 | 12.5 | 1.0 |
| O | Slv. Length & cuff | 56.5 | 58.5 | 62.5 | 62.5 | 64.5 | 2.0 |
| P | Cuff Buttoned | 20 | 21 | 22 | 23 | 24 | 1.0 |

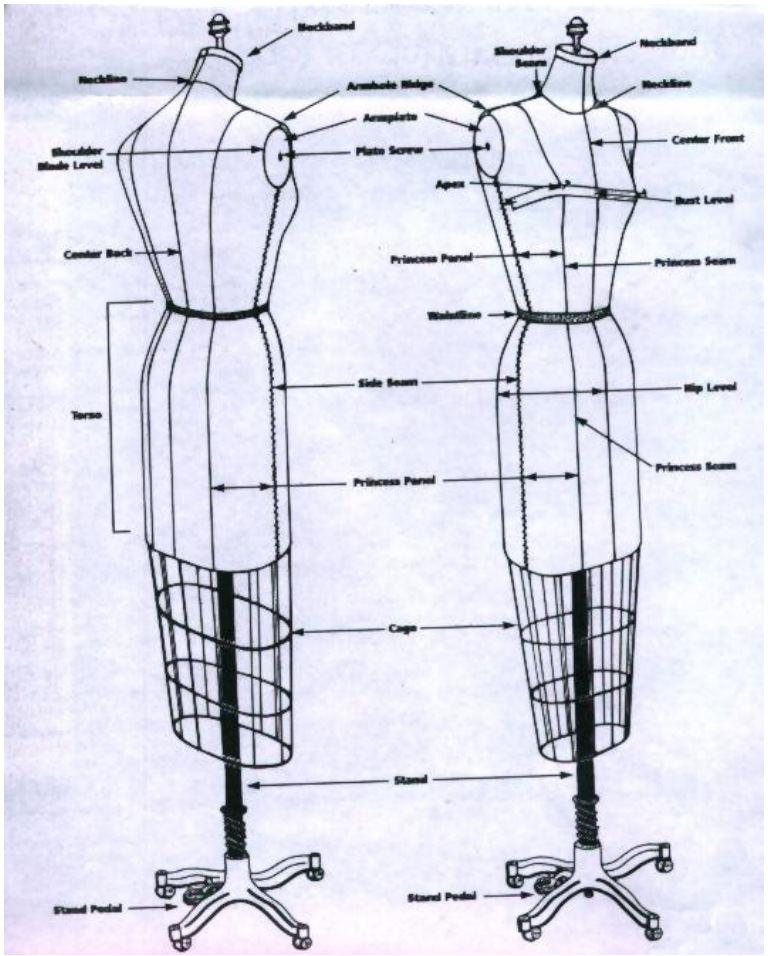



**Photocopies of Fashion lecturers handouts:**
Sourced from UK Fashion design courses

## Standard size chart

| | SML | MED | LGE | XLGE |
|---|---|---|---|---|
| SIZE SYMBOL | S | M | L | XL |
| BUST | 82 | 88 | 94 | 100 |
| WAIST | 62 | 68 | 74 | 80 |
| HIP | 87 | 93 | 99 | 105 |
| BACK WIDTH | 32.8 | 34.4 | 36 | 37.6 |
| CHEST | 30.6 | 32.4 | 34.2 | 36 |
| SHOULDER | 11.9 | 12.3 | 12.6 | 13 |
| NECK SIZE | 35.5 | 37 | 38.5 | 40 |
| DART | 6.1 | 7 | 7.9 | 8.8 |
| TOP ARM | 26.4 | 28.4 | 30.4 | 32.4 |
| WRIST | 15.3 | 16 | 16.7 | 17.4 |
| ANKLE | 23.1 | 24 | 24.9 | 25.8 |
| HIGH ANKLE | 20.1 | 21 | 21.9 | 22.8 |
| NAPE TO WAIST | 39.2 | 40 | 40.8 | 41.6 |
| FRONT SHOULDER TO WAIST | 39.2 | 40 | 41 | 42 |
| ARMHOLE DEPTH | 20.2 | 21 | 21.8 | 22.6 |
| WAIST TO KNEE | 57.7 | 58.5 | 59.3 | 60.1 |
| WAIST TO HIP | 20.2 | 20.6 | 21 | 21.4 |
| WAIST TO FLOOR | 102.5 | 104 | 105.5 | 107 |
| BODY RISE | 27 | 28 | 29 | 30 |
| SLEEVE LENGTH | 57.4 | 58.4 | 59.4 | 60.4 |
| SLEEVE LENGTH (JERSEY) | 51.4 | 52.4 | 53.4 | 54.4 |
| **Extra measurements (garments)** | | | | |
| CUFF SIZE SHIRTS | 21 | 21.5 | 22 | 22.5 |
| CUFF SIZE, TWO-PIECE SLEEVE | 13.5 | 13.75 | 14 | 14.25 |
| TROUSER BOTTOM WIDTH | 21.5 | 22 | 22.5 | 23 |
| JEANS BOTTOM WIDTH | 18.5 | 19 | 19.5 | 20 |

## Workroom toile stand




**Photocopies of Fashion lecturers handouts:** Sourced from UK Fashion design courses

Body measurement, Body awareness, Ethical awareness
in FE Fashion Design & ‘live student demo in Tailoring module:

Taylor, A. 2004.

BA(Hons) Fashion final year Marketing & Production fit session tutorials. Students selected for fit model duties.
Taylor, A. 2005.

BA(Hons) Fashion final year
Marketing & Production fit session tutorials.
Students selected for fit model duties.
Taylor, A. 2005.

**UK Fashion courses – 2D communication of the 3D body.**

Are we repeating old methods and encouraging outdated traditional 2D instead of 3D thinking ?

Can 3D tools provide opportunities for evolving new methods of creativity and design experimentation through use of 3D thinking , 3D CG technologies or 3D CAD systems ?

Taylor, A. 2005; Final year BA Fashion Marketing student 2D digital illustration

Taylor, A. 2005; Final year Manufacturing 2D pattern drafting in AssystCAD

## Literature Review

**identified interview opportunites:**

- Current academic research using 3D whole body scanners to enhance the curriculum in fashion and clothing universities worldwide, emphasises the extent of acceptance in 3D technologies. Bougourd (2005), Bunka (2005), ExploreCornell (2005).

**Interviews _** emailed SIZE UK & 3D Research group Director Jennifer Bougourd at London College of Fashion. In the first interview , Jenni talked about 3D scanning and kindly gave ethical confidentiality agreement developed for SIZE UK as a scanned document. And also explained the methodology from the survey.
Then I re-visited, as I was invited to talk the 3D research group during a University of the Arts collaborative meeting. Before presenting 3D research, I asked for their permission to record the meeting as a focus group using questions as a framework. Participants all agreed. The meeting was recorded as a focus group.

- **NOTES:**
- I setup scan firstly wearing clothes, this was as expected and not really useful for recording 3D body data to provide accurate fit. I tested tight fitting clothing and found that dark colours wouldn't reflect data back to the scanner. Skin is perfect and gives good results.
-
- Setting up a educational body scanning experiment and scanning a sample group of fashion students doing final collections in their final year was ambitious and not going to easy but I felt it was important and new educational experiment which could provide quality results for the PhD. A group sample reflecting size labeling range S, M, L, fashion students who have 8-10 , 12 and usually do fit checks were invited to join the experiment. Some of the girls approached for the large size were'nt interested in the idea,but an MA student working with the Textiles and body happily volunteered. And I was the male standard size 40 which helped.
-
-
- There were issuses to be overcome on privacy, trust and confidentiality. One of the ways I solved this was to have made S, M, L scan outfits to protect body and some privacy, but also reflect data effectively. I had developed a research relationship over the year with observation and informal interviews so they were familiar with the research and me. But nevertheless, data confidentiality can be abused so I drafted a legally approved confidentiality agreement which we each signed protecting the volunteers and me if the digital data was mis –used by others.
-
-
- Different idea and tools were tested for improving the processes necessary for scanning the body.
-
- Fashion dept in QS teaching annexe, private teaching portacabin /room off workrooms, changing screen, and blinds to protect privacy of the scan. I invited small groups to ask questions but I rejected this to focus on the experiment, and also the volunteers weren't keen on being watched by their group.
-
- Manual measurement methods were also used to compare effectivesness of scanner.
-

**COMPLETED RESEARCH PAPER:**

During the pre-test experiments, a series of evaluation scans are recorded: variety of head positions, normal everyday clothed bodies and bodies wearing personal choice close fitting sportswear were scanned. These pre-tests were carried out to assess the quality of the scan results and performance of the scanner for recording different physical properties. The properties selected for testing were; environment, light levels, distance/depth and range of the laser in the scanner, the quality of colour, textures, fabrics and shapes of surfaces/objects.

Early results during the pre-tests highlighted important areas. Sleeveless tops and leggings were made from white stretch Lycra to provide scan volunteer uniformity, comfort and overcome unsuccessful scan results with random volunteer choice of certain types of fabrics/clothing.

The scan outfits were made in three sizes, small, medium and large, intended to cover underwear and closely fit any volunteers' body shape.

MASTER

# Confidentiality Agreement

Subject code: ☐

Date/Time: ☐

All data collected for this study is covered by the U.K. Data Protection Act (1998) and E.U. Data Protection Directive (95/46/EC) Your data will be stored and *will* ***remain anonymous at all times.***

It will be used for purposes of research by collaborating organizations in the Centre for 3D Electronic Commerce.

Please tick the boxes below if you will give permission for your body scan and measurement data to be made available for certain other purposes.

☐ I give permission for my body scan and measurement data to be used ***anonymously*** for demonstration purposes and in publications related to research.

☐ I give permission for my body scan and measurement data to be made available ***anonymously*** in the protected data bank.

Please sign and date below if you have read and agree to the above. Your signature is only for use in this study and will not be passed to any external agencies.

Signed: _____

Date: _____

Measured by: _____

Scanned by: _____

Ethics confidentiality agreement used with permission of SIZE UK during interview with Jennifer Bougourd at London college of Fashion.

size uk

# UK National Sizing Survey: Confidentiality Agreement

Subject Code [ ] Date/Time [ ]

Thank you for participating in the National Sizing Survey. This document gives permission for us to use your data. Please read the following carefully.

**3D Photo-Booths**

To automatically measure your body the Survey employs 3D photo-booths that use safe flashing light. Please do not participate if you experience problems with flashing light.

**Data Protection**

Your personal data (as defined in the Data Protection Act 1998 and which may include your body scans, measurements and market research data) may be used by the UK Companies and Academic Institutions (who are listed below) collectively, and individually. In legal terms, all such parties will be data controllers of the data and may process the data for the following purposes:

1 1 Creating a databank of the body scans, measurements and market research data that will be remotely accessed over the Internet.

2 2 Analysing the databank to produce measurement data related to clothing.

3 3 Onward sale or transmission of anonymous data to other research institutions and commercial organisations, not necessarily for clothing purposes.

This information is confidential and you will not receive any marketing material as a result of participating in the National Sizing Survey.

You may, at any time, request a copy of personal data that we hold about you. There is a small fee for provision of this data.

**Confidentiality**

You agree to keep confidential, and not to disclose to any third party, any non-public information in relation to this study, including your participation in it.

**Intellectual Property Rights**

All intellectual property rights created by or in relation to this study of which your body scans, measurements and market research data form part, will vest in the UK Clothing Companies or as decided between them.

Please sign and date below to show that you have read and accept the above terms.

Participant Signature: _____ Date: _____

Interviewed by: _____

**List of Collaborating Organisations**

| | | |
|---|---|---|
| Arcadia Group plc | Marks and Spencer plc | De Montfort University |
| BHS Ltd | N Brown plc | Heriot-Watt University |
| Bodymetrics Ltd | Monsoon Accessorize | Leeds College of Art & Design |
| Debenhams plc | Oasis Stores plc | London College of Fashion |
| Freemans Ltd | REDCATS (UK) | Manchester Metropolitan University |
| Grattan Home Shopping Ltd | Rohan Designs Ltd | The Nottingham Trent University |
| Great Universal Stores plc | Select Research Ltd | Southampton Institute |
| House of Fraser plc | Speedo International Ltd | University College London |

SIZEUK confidentiality agreement. Permission given during interview with Jennifer Bougourd at London college of Fashion. The use Master document was sent by email to be adapted for University of Huddersfield 3D body scan experiments.

University of Huddersfield. 3D Research confidentiality agreement. Permission was given by Dean of the School of ADA, and Ethics advisor in Student Services to conduct body scan experiments using student group as a sample.

# 3D PhD Research project
# Confidentiality Agreement

Thank you for participating in the 3D PhD Research Project. This document gives permission for the academic institutions; The University of Huddersfield, and The Manchester Metropolitan University to use your data. Please read the following carefully.

**3D Scanners**

To Automatically measure your body the project employs a 3D scanner that uses safe light. Please do not participate if you experience problems with flashing light.

**Data Protection**

All personal data collected for this survey is covered by the Data Protection Act 1998 and the E.U Data Protection Directive (95/46/EC). *Your data will be use for the purposes of research by the academic institutions (listed above) and will remain* ***anonymous*** *at all times.*

Please tick the box if you will give permission for your body scan and measurement data to be used ***anonymously*** for the following academic research:

☐ I give permission for my body scan and measurement data to be used ***anonymously*** for demonstration purposes and in publications related to research.

Please sign and date below if you have and agreed to the above. Your signature is only for use in this study and will not be passed to any external agencies.

**Signed by** _____

**Date** _____

# Objectives of the study

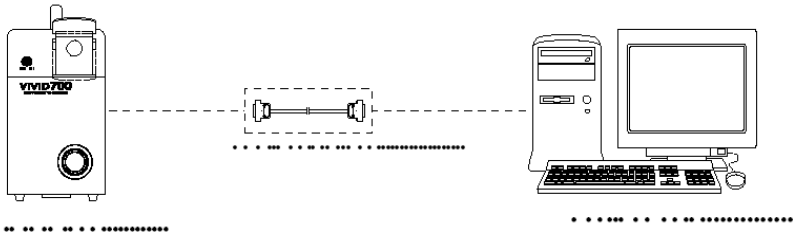
1. To evaluate 3D Laser scanner in fashion education

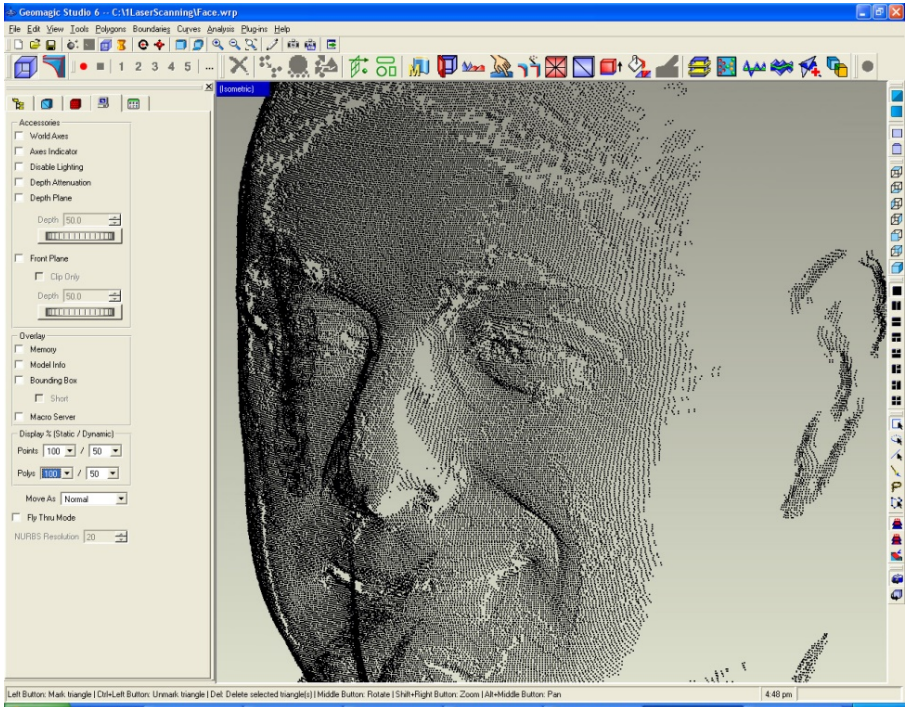
2. To body scan a sample group of students

3. To introduce ethical approaches to scanning bodies

4. To develop new methods for integrating 3D body data

# 3D Scanner on tripod connected to Laptop
# Phase 1 clothed experiments were setup in busy staff office.

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Accessories
World Axes
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Disable Lighting
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Depth Plane
Front Plane
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Macro Server
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Points 100 / 50
Polys 100 / 50
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Fly Thru Mode
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[Isometric]
Left Button: Mark triangle | Ctrl+Left Button: Unmark triangle | Del: Delete selected triangle(s) | Middle Button: Rotate | Shift+Right Button: Zoom | Alt+Middle Button: Pan
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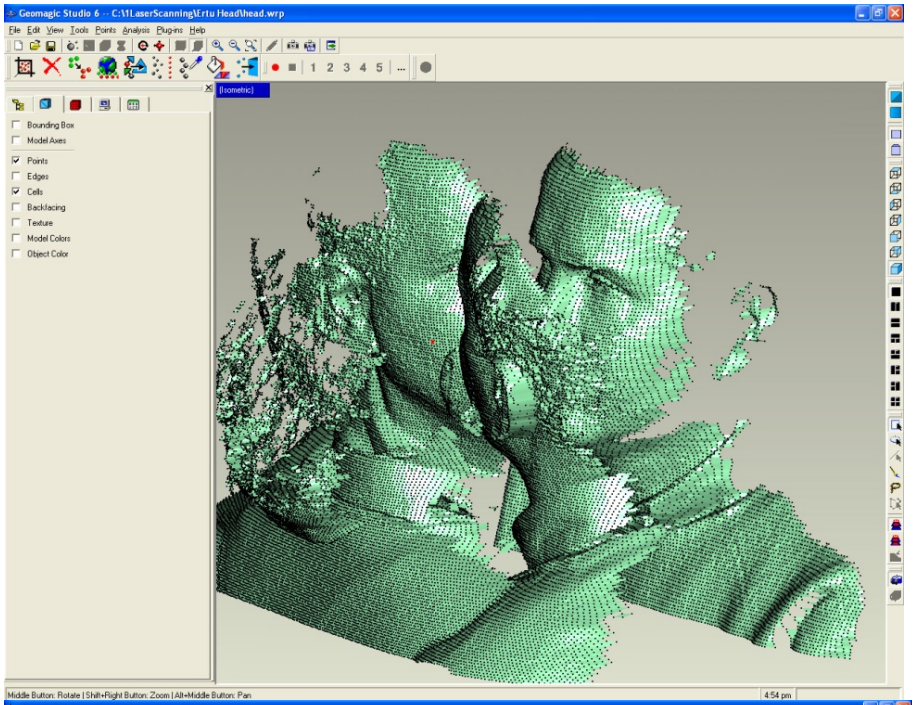
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Edges
Cells
Backfacing
Texture
Model Colors
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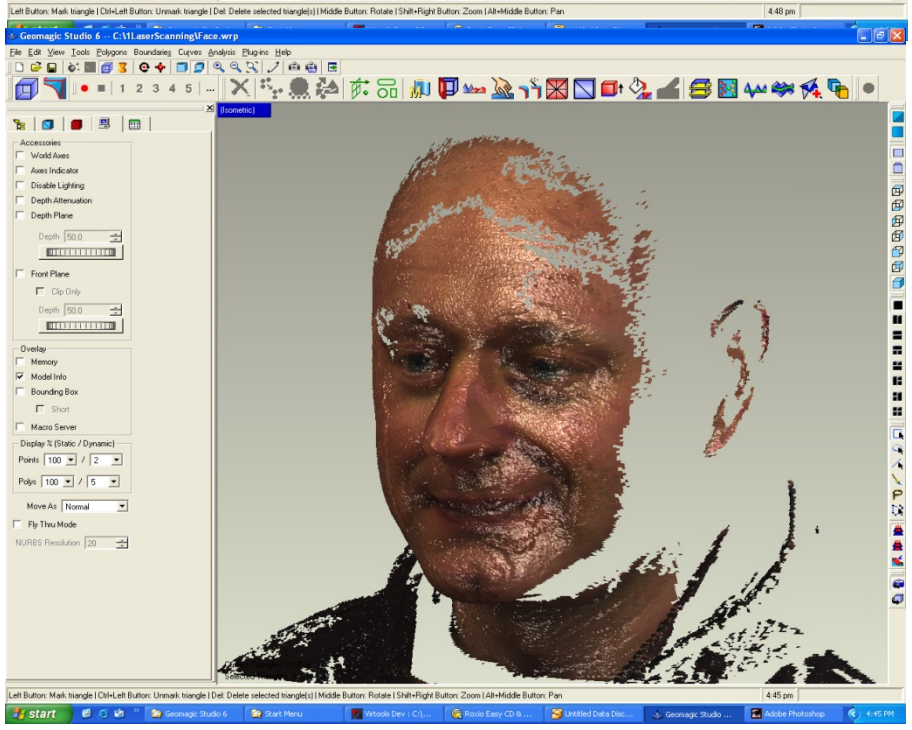
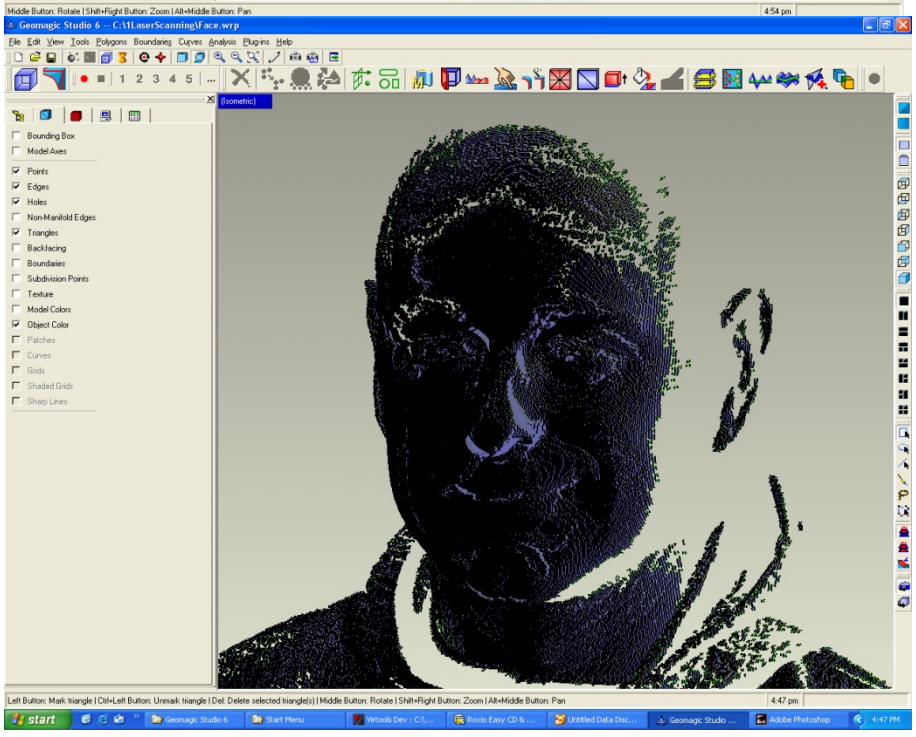
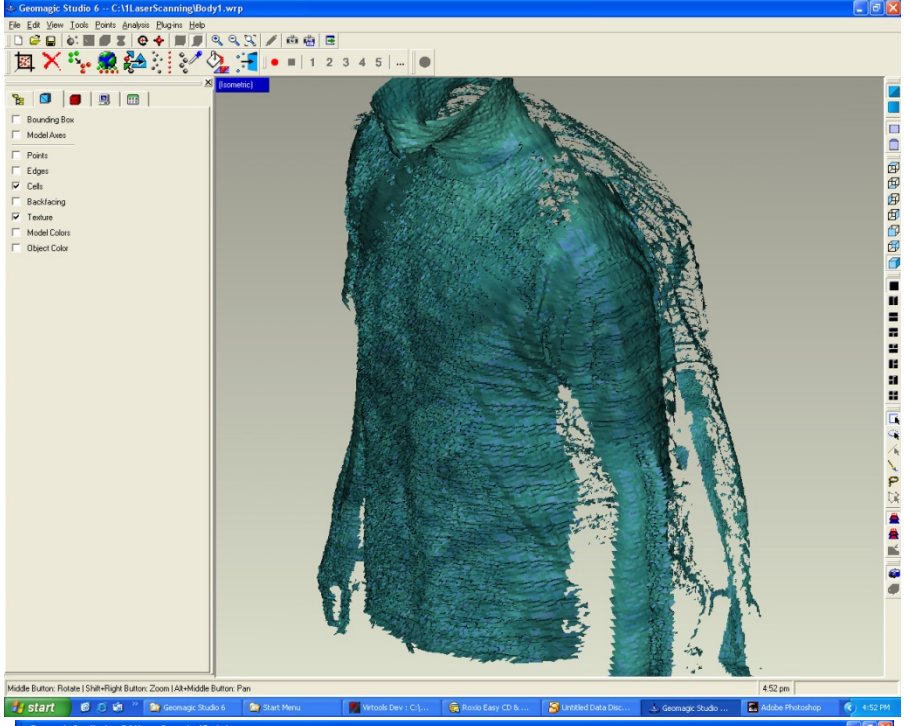
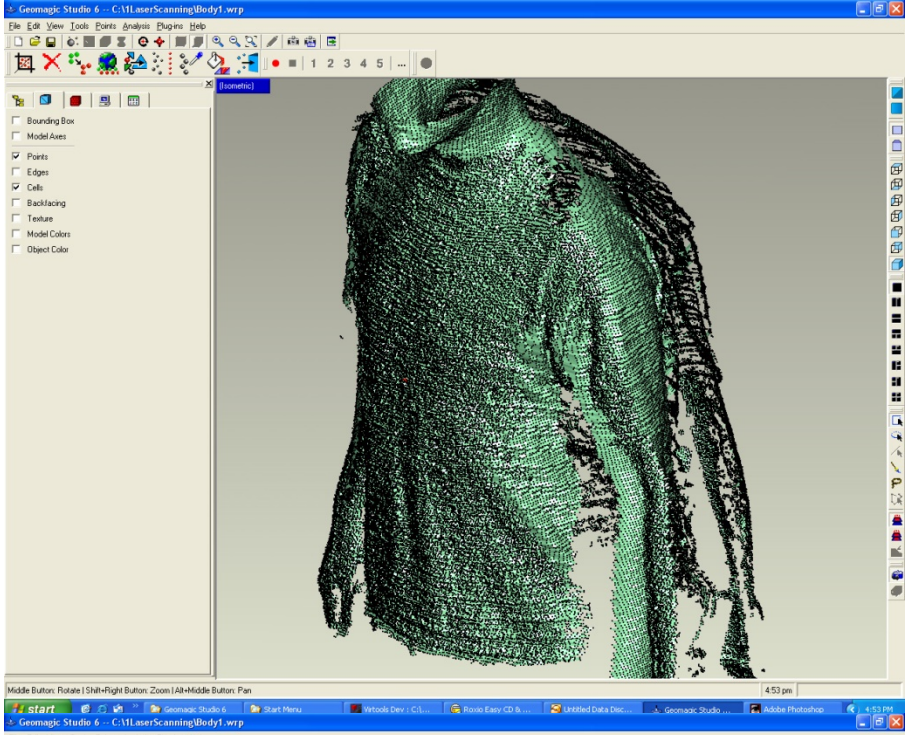
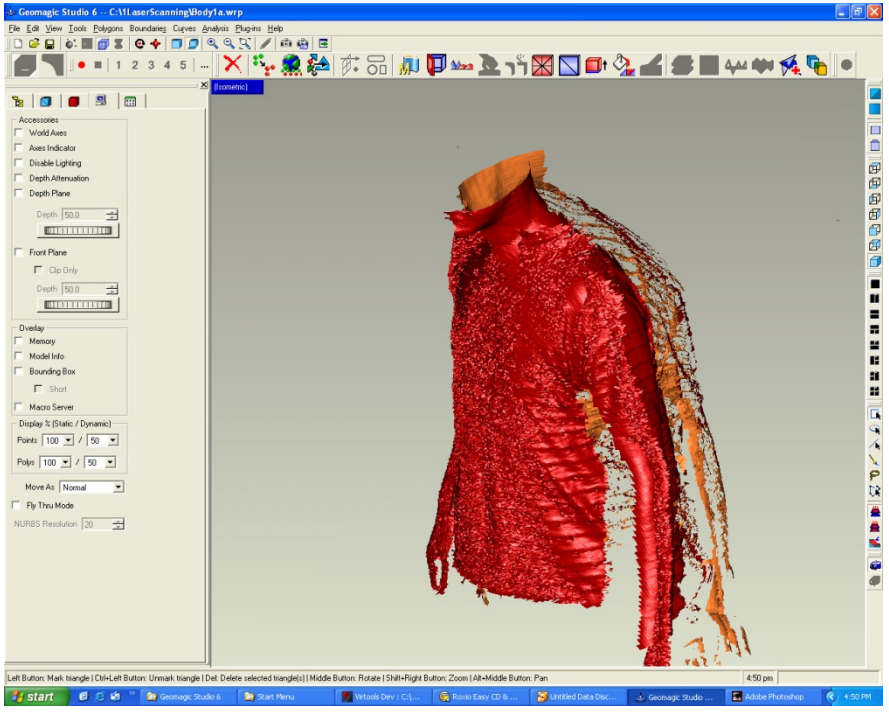
Middle Button: Rotate | Shift+Right Button: Zoom | Alt+Middle Button: Pan
4:54 pm

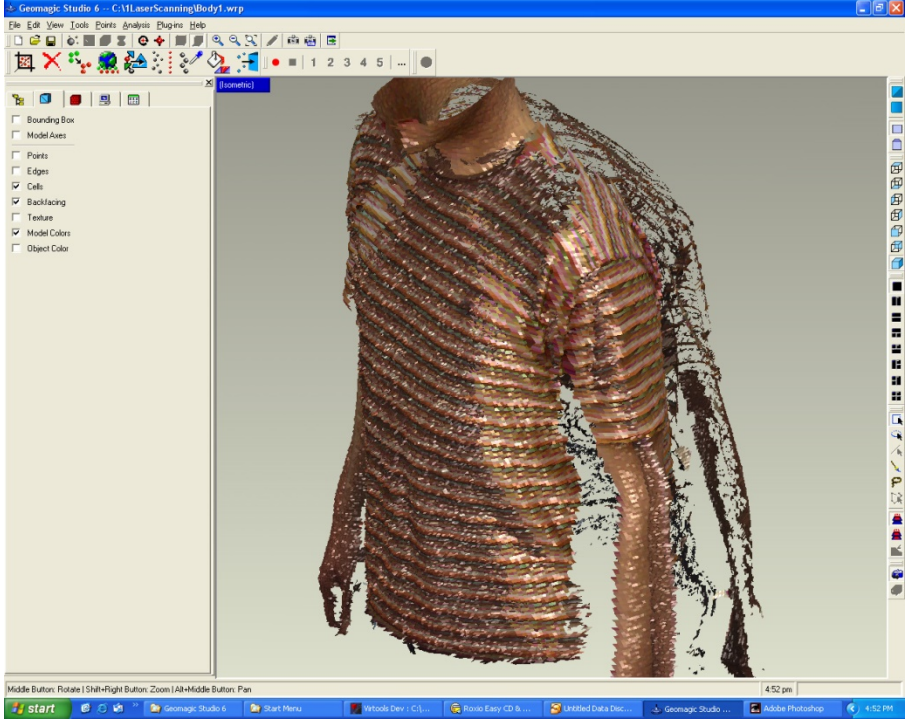

Geomagic Studio 6 -- C:\1LaserScanning\Face.wrp
File Edit View Tools Polygons Boundaries Curves Analysis Plug-ins Help
Accessories
World Axes
Axes Indicator
Disable Lighting
Depth Attenuation
Depth Plane
Front Plane
Clip Only
Overlay
Memory
Model Info
Bounding Box
Short
Macro Server
Display % (Static / Dynamic)
Points 100 / 2
Polys 100 / 5
Move As Normal
Fly Thru Mode
NURBS Resolution 20
[Isometric]
Left Button: Mark triangle | Ctrl+Left Button: Unmark triangle | Del: Delete selected triangle(s) | Middle Button: Rotate | Shift+Right Button: Zoom | Alt+Middle Button: Pan
4:45 pm
start
Geomagic Studio 6
Start Menu
Virtools Dev : C:\...
Roxio Easy CD & ...
Untitled Data Disc...
Geomagic Studio ...
Adobe Photoshop
4:45 PM

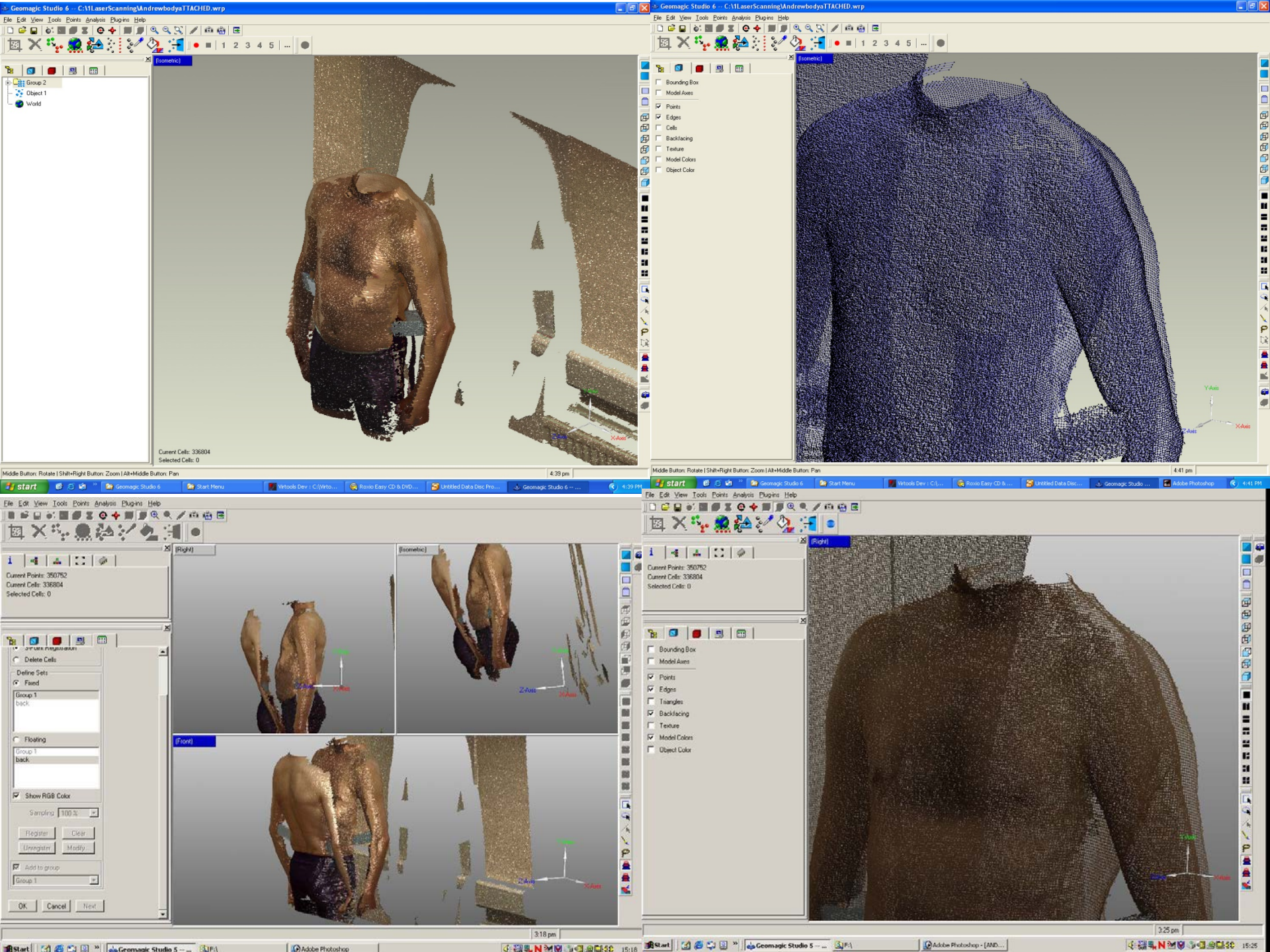

Geomagic Studio 6 -- C:\1LaserScanning\Face.wrp
File Edit View Tools Polygons Boundaries Curves Analysis Plug-ins Help
Bounding Box
Model Axes
Points
Edges
Holes
Non-Manifold Edges
Triangles
Backfacing
Boundaries
Subdivision Points
Texture
Model Colors
Object Color
Patches
Curves
Grids
Shaded Grids
Sharp Lines
[Isometric]
Left Button: Mark triangle | Ctrl+Left Button: Unmark triangle | Del: Delete selected triangle(s) | Middle Button: Rotate | Shift+Right Button: Zoom | Alt+Middle Button: Pan
4:47 pm
start
Geomagic Studio 6
Start Menu
Virtools Dev : C:\...
Roxio Easy CD & ...
Untitled Data Disc...
Geomagic Studio ...
Adobe Photoshop
4:47 PM


Geomagic Studio 6 -- C:\1LaserScanning\Body1.wrp
File Edit View Tools Points Analysis Plug-ins Help
Bounding Box
Model Axes
Points
Edges
Cells
Backfacing
Texture
Model Colors
Object Color
Middle Button: Rotate | Shift+Right Button: Zoom | Alt+Middle Button: Pan


Geomagic Studio 6 -- C:\1LaserScanning\Body1.wrp
File Edit View Tools Points Analysis Plug-ins Help
Bounding Box
Model Axes
Points
Edges
Cells
Backfacing
Texture
Model Colors
Object Color
Middle Button: Rotate | Shift+Right Button: Zoom | Alt+Middle Button: Pan


Geomagic Studio 6 -- C:\1LaserScanning\Body1a.wrp
File Edit View Tools Polygons Boundaries Curves Analysis Plug-ins Help
Accessories
World Axes
Axes Indicator
Disable Lighting
Depth Attenuation
Depth Plane
Front Plane
Overlay
Memory
Model Info
Bounding Box
Macro Server
Display % (Static / Dynamic)
Fly Thru Mode
Left Button: Mark triangle | Ctrl+Left Button: Unmark triangle | Del: Delete selected triangle(s) | Middle Button: Rotate | Shift+Right Button: Zoom | Alt+Middle Button: Pan


Geomagic Studio 6 -- C:\1LaserScanning\Body1.wrp
File Edit View Tools Points Analysis Plug-ins Help
Bounding Box
Model Axes
Points
Edges
Cells
Backfacing
Texture
Model Colors
Object Color
Middle Button: Rotate | Shift+Right Button: Zoom | Alt+Middle Button: Pan


Geomagic Studio 6 -- C:\1LaserScanning\AndrewbodyaTTACHED.wrp
File Edit View Tools Points Analysis Plug-ins Help
Group 2
Object 1
World
[Isometric]
Current Cells: 336804
Selected Cells: 0
Middle Button: Rotate | Shift+Right Button: Zoom | Alt+Middle Button: Pan
Bounding Box
Model Axes
Points
Edges
Cells
Backfacing
Texture
Model Colors
Object Color
Triangles
Current Points: 350752
[Right]
[Front]
Delete Cells
Define Sets
Fixed
Floating
Show RGB Color
Register
Clear
Unregister
Modify
Add to group
OK
Cancel
Next

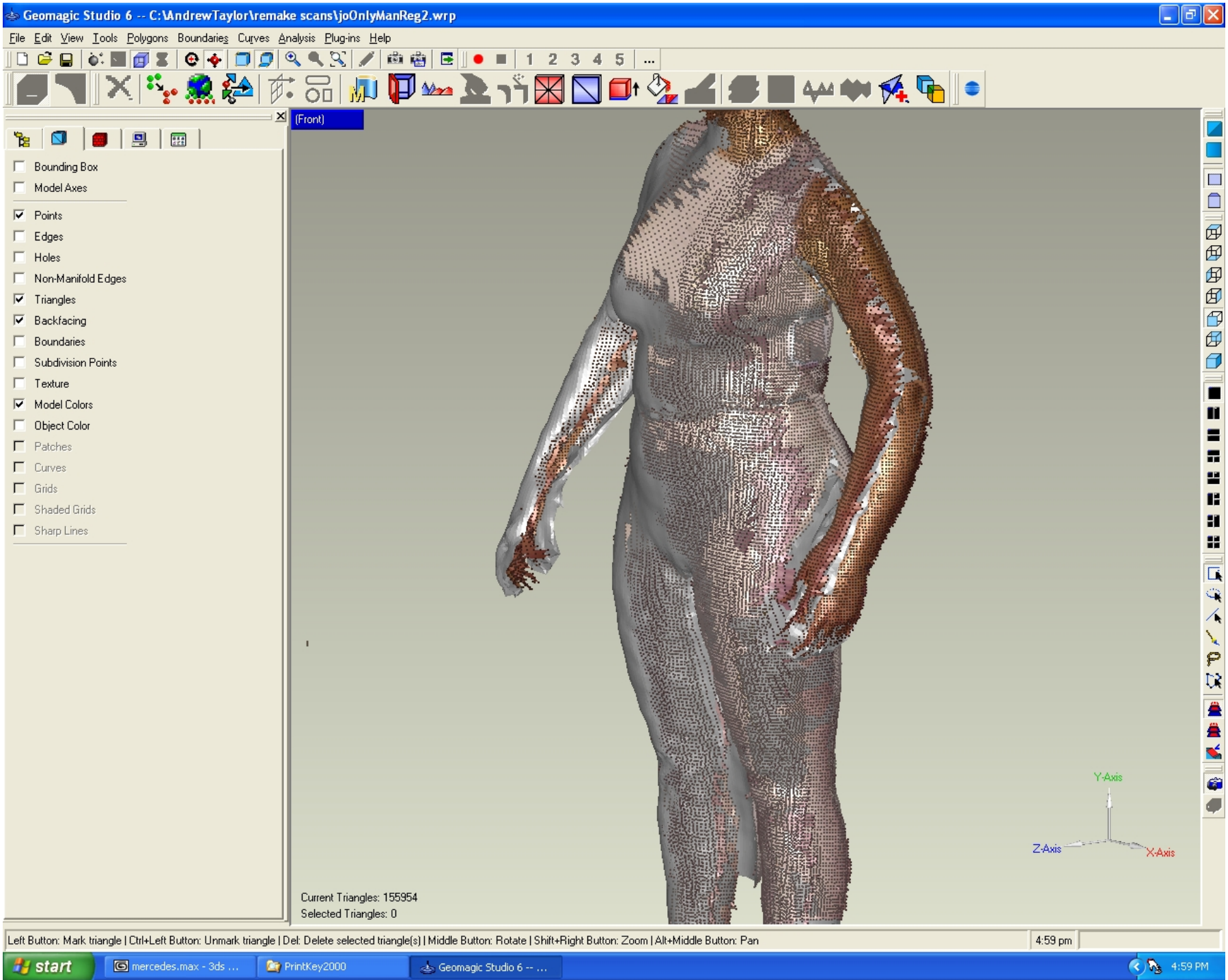
# Experiment tools tested

# White lycra scanning clothing made to fit the body and cover body for privacy


MINOLTA
REMOTE
MINOLTA

# Body scan in process

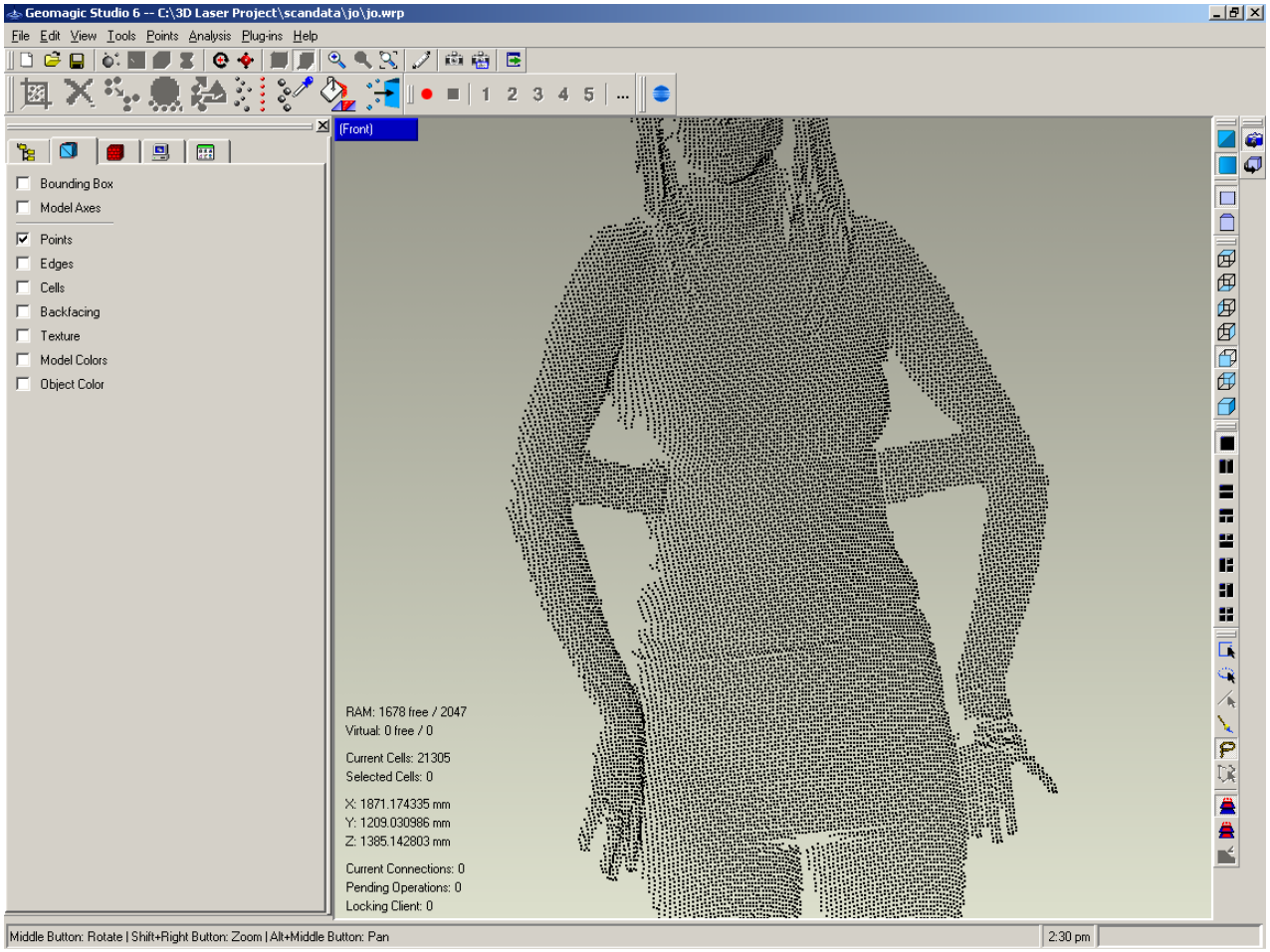

MINOLTA


Geomagic Studio 6 -- C:\AndrewTaylor\remake scans\joOnlyManReg2.wrp
File Edit View Tools Polygons Boundaries Curves Analysis Plug-ins Help
1 2 3 4 5 ...
(Front)
Bounding Box
Model Axes
Points
Edges
Holes
Non-Manifold Edges
Triangles
Backfacing
Boundaries
Subdivision Points
Texture
Model Colors
Object Color
Patches
Curves
Grids
Shaded Grids
Sharp Lines
Y-Axis
Z-Axis
X-Axis
Current Triangles: 155954
Selected Triangles: 0
Left Button: Mark triangle | Ctrl+Left Button: Unmark triangle | Del: Delete selected triangle(s) | Middle Button: Rotate | Shift+Right Button: Zoom | Alt+Middle Button: Pan
4:59 pm
start
mercedes.max - 3ds ...
PrintKey2000
Geomagic Studio 6 -- ...
4:59 PM

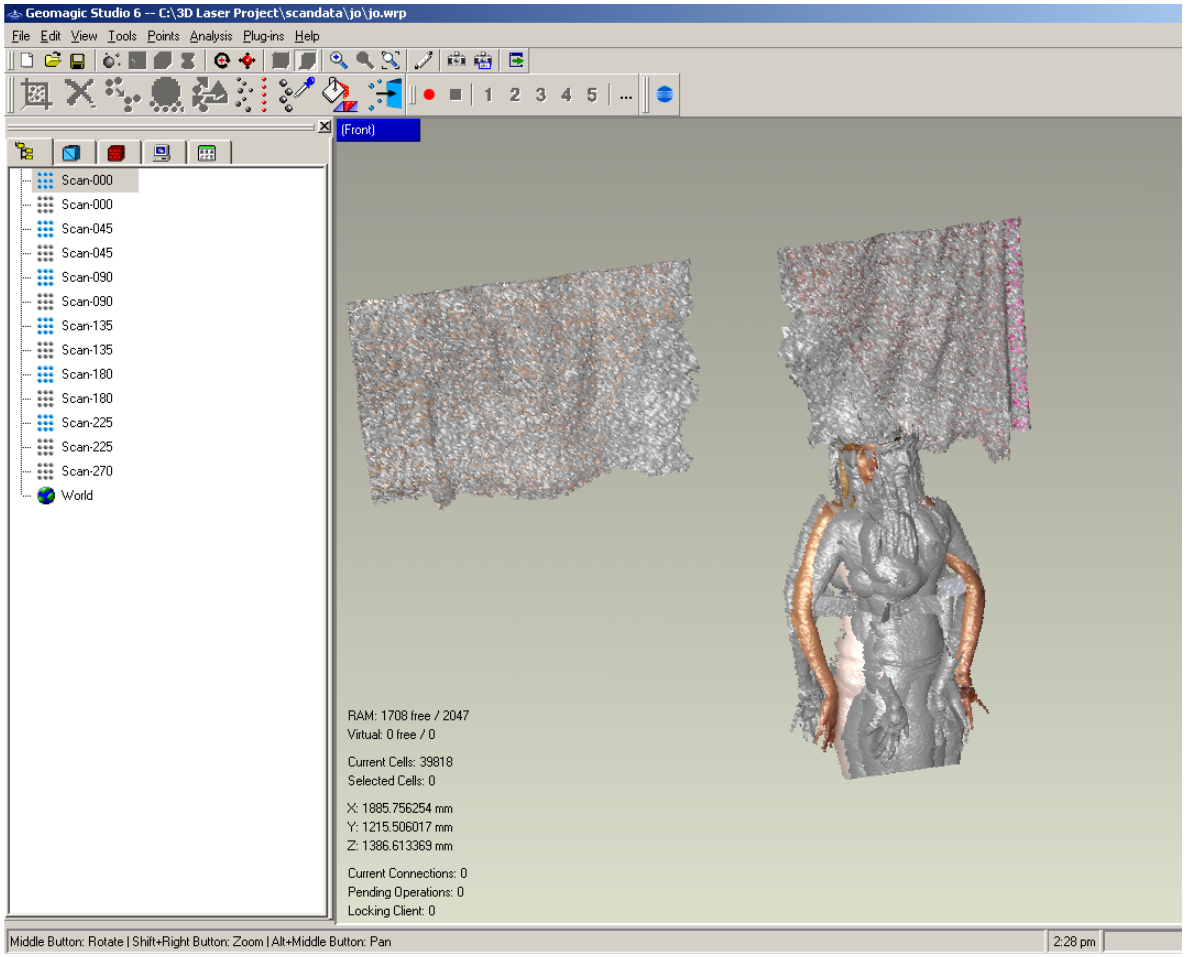


# Comparative manual measurement experiment to analyse body scanning accuracy and user experiences

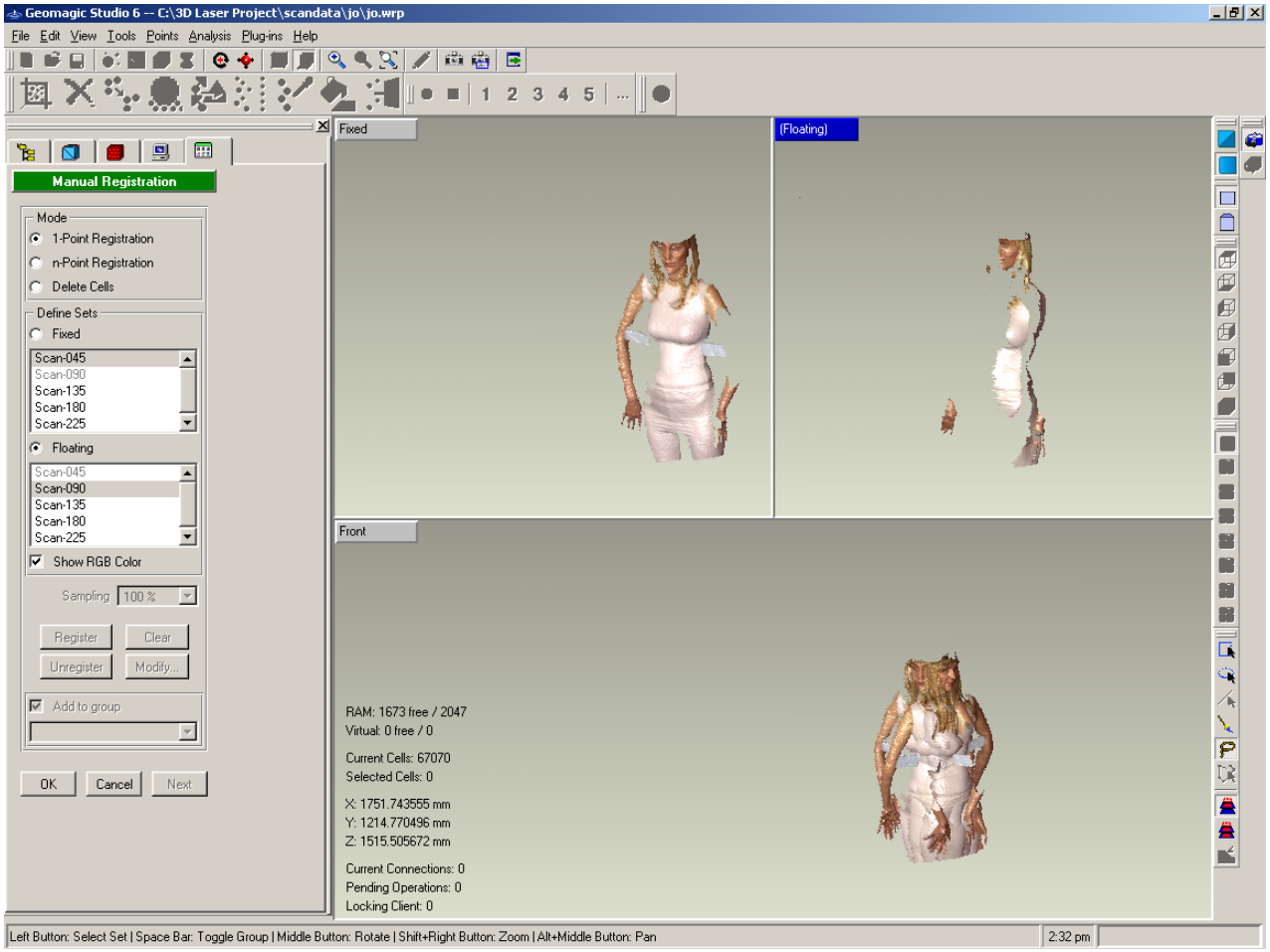
# Point cloud data 500,000 dots



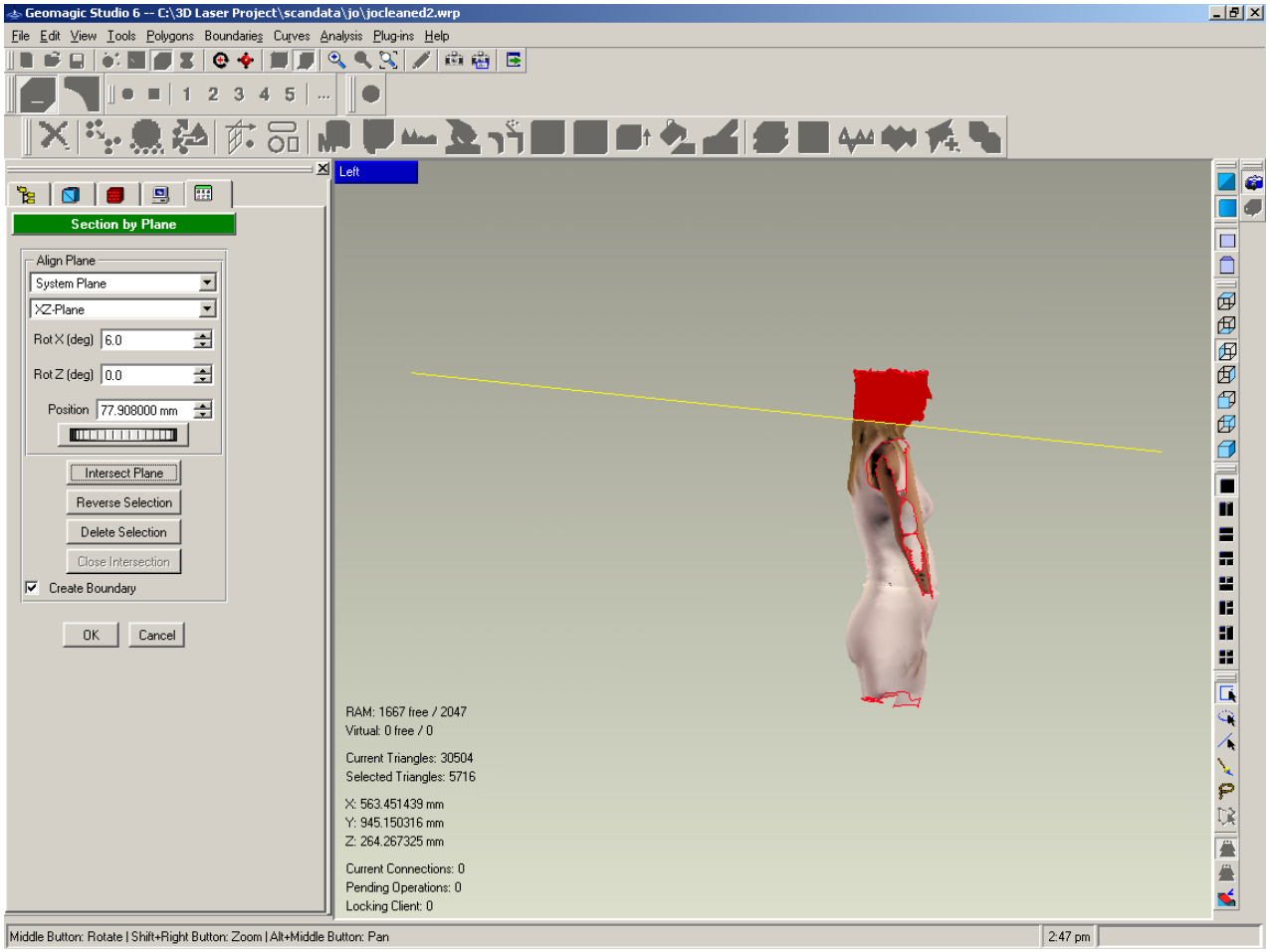
# Scan data pre edit



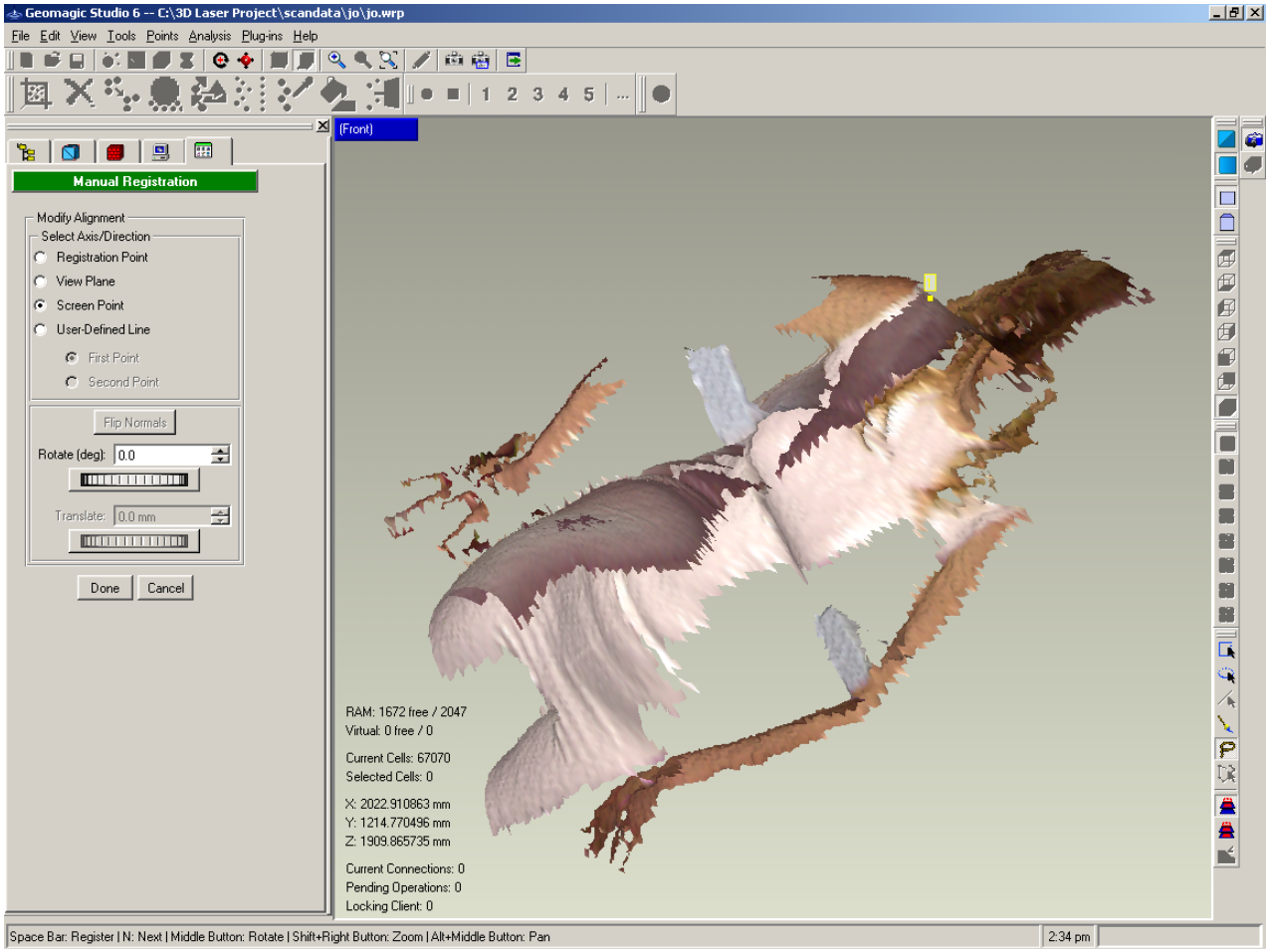
# Manual registration to join surfaces



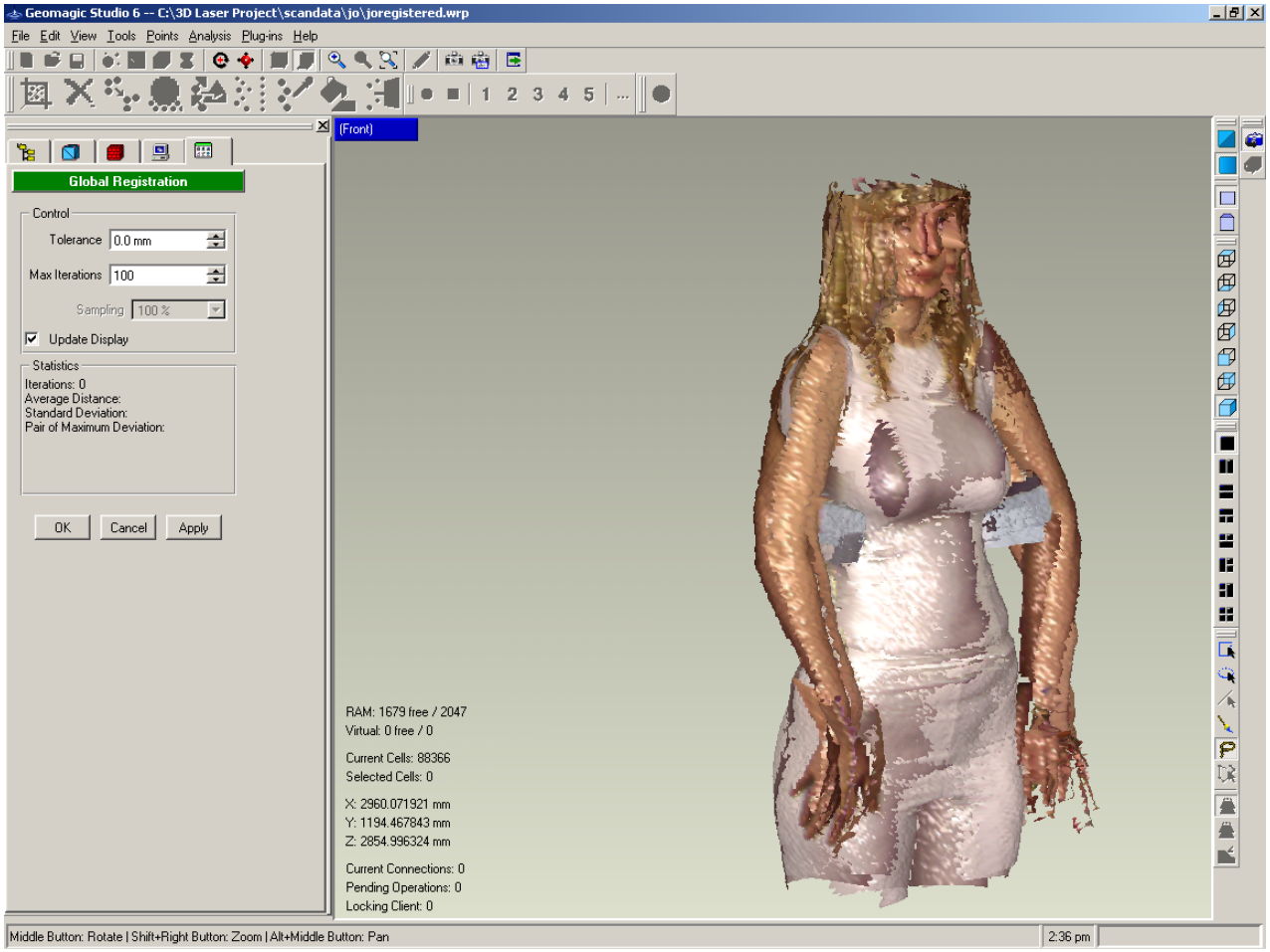
# Choose section by plane



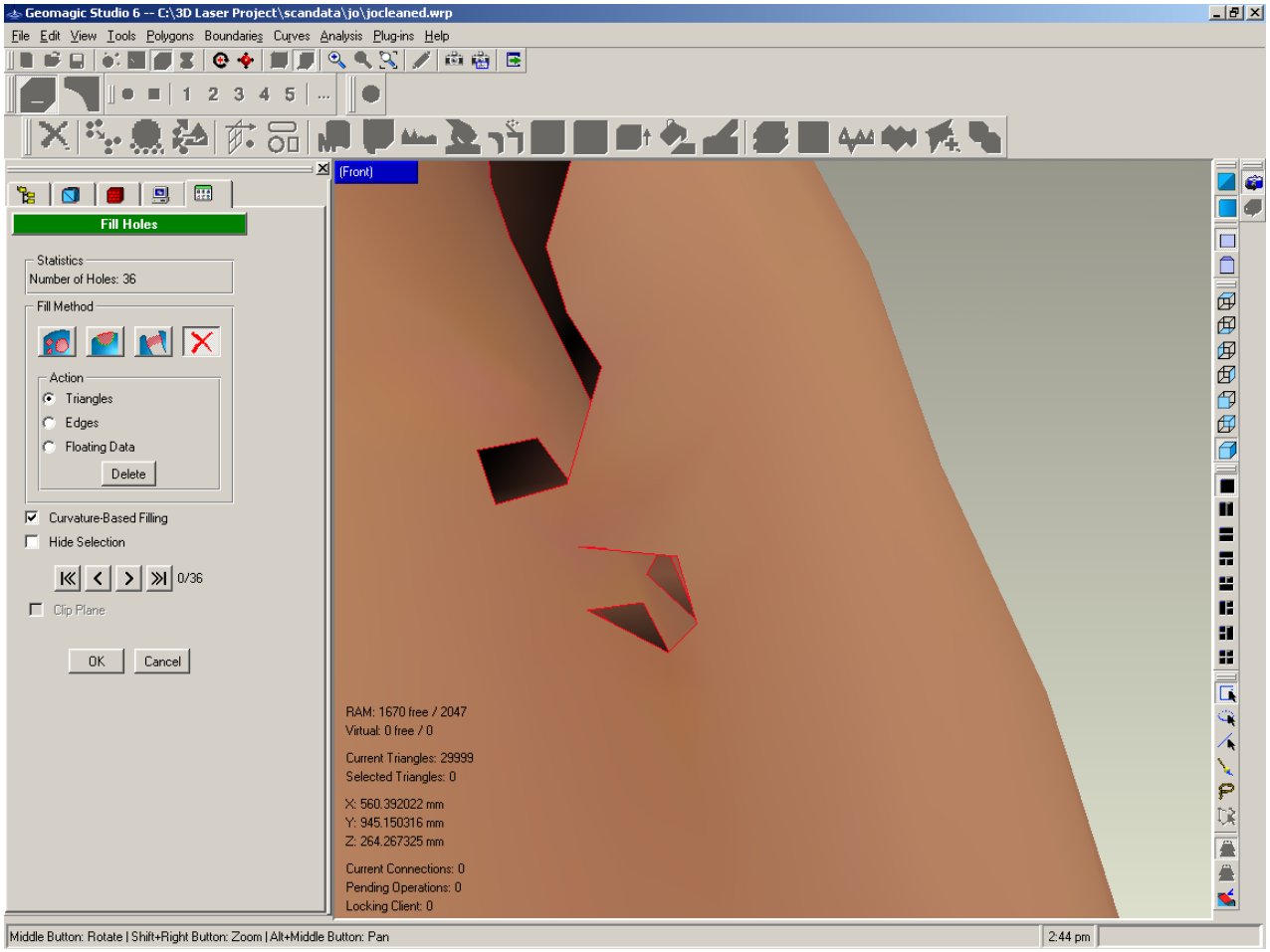
# Modify selection in manual registration



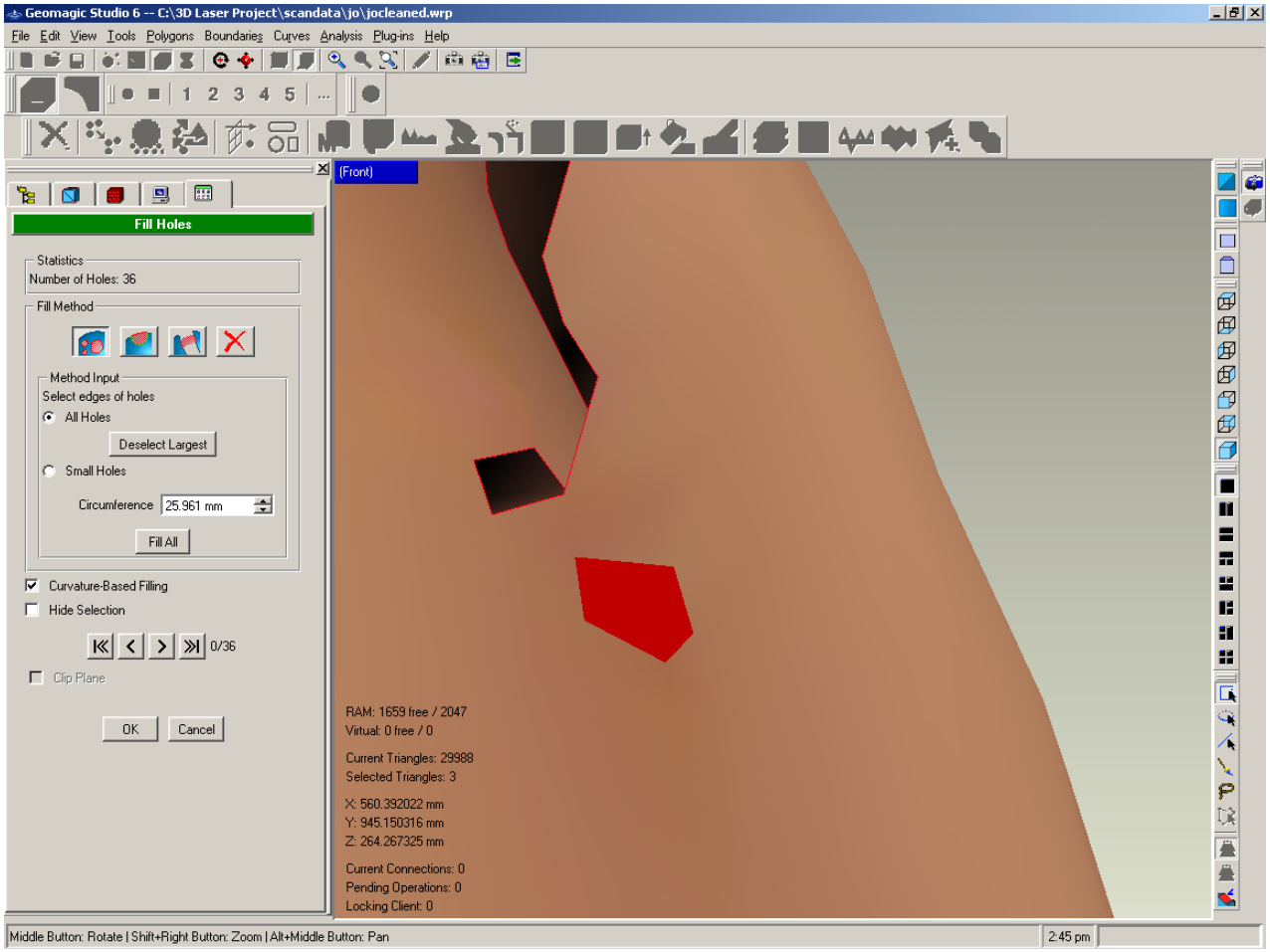
# Global registration



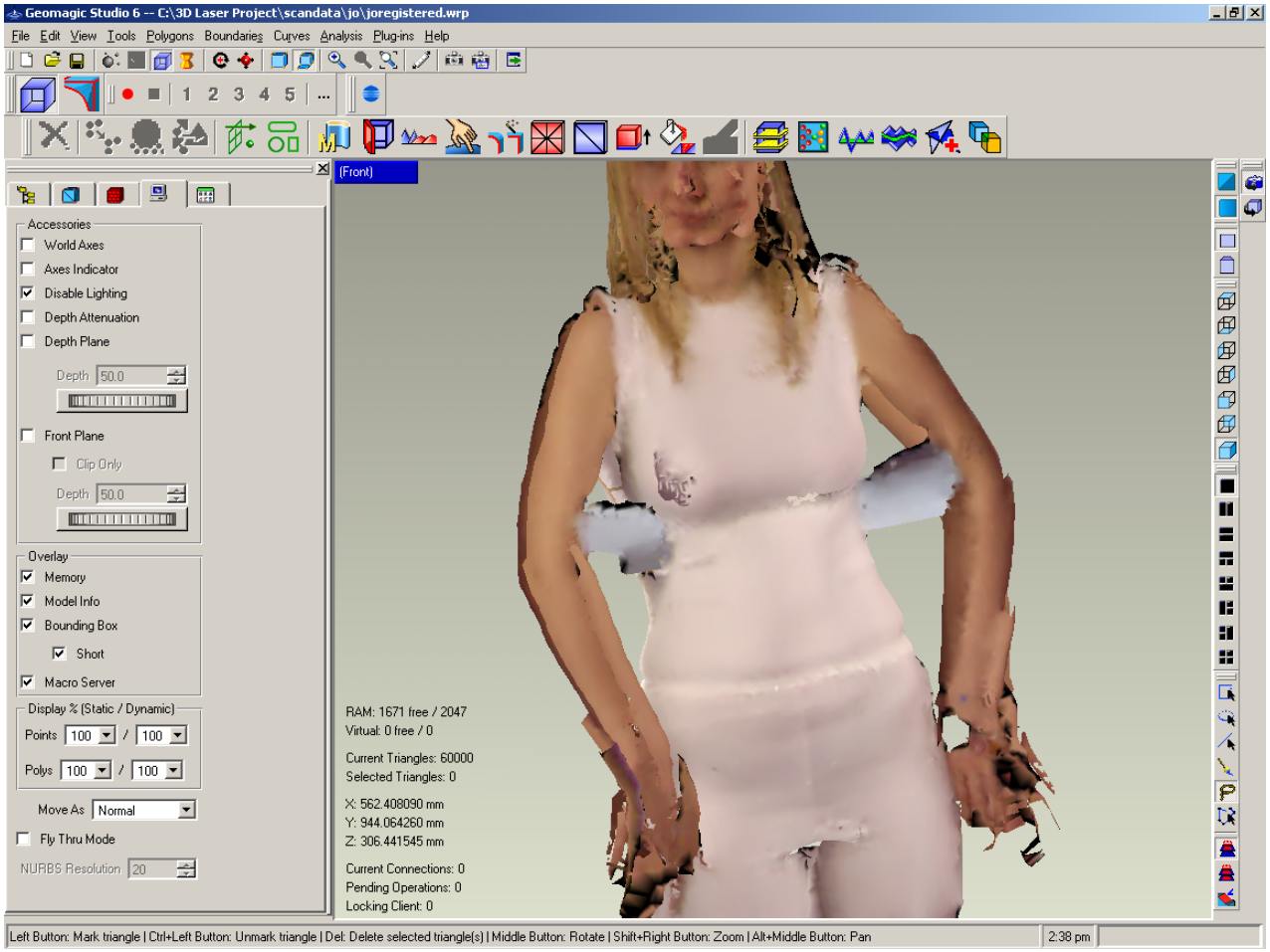
# Holes in surface



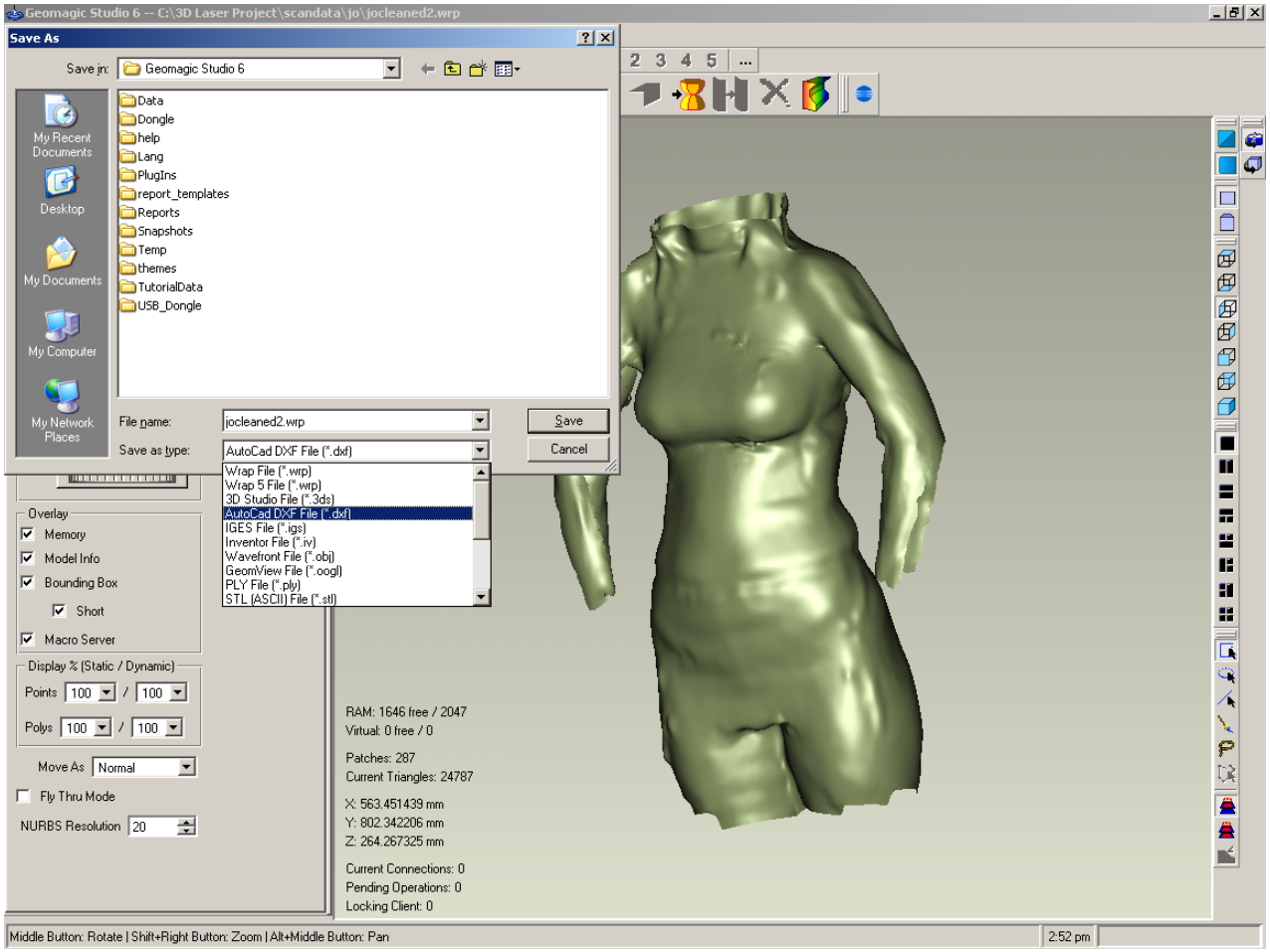
# Quickly filled and smoothed



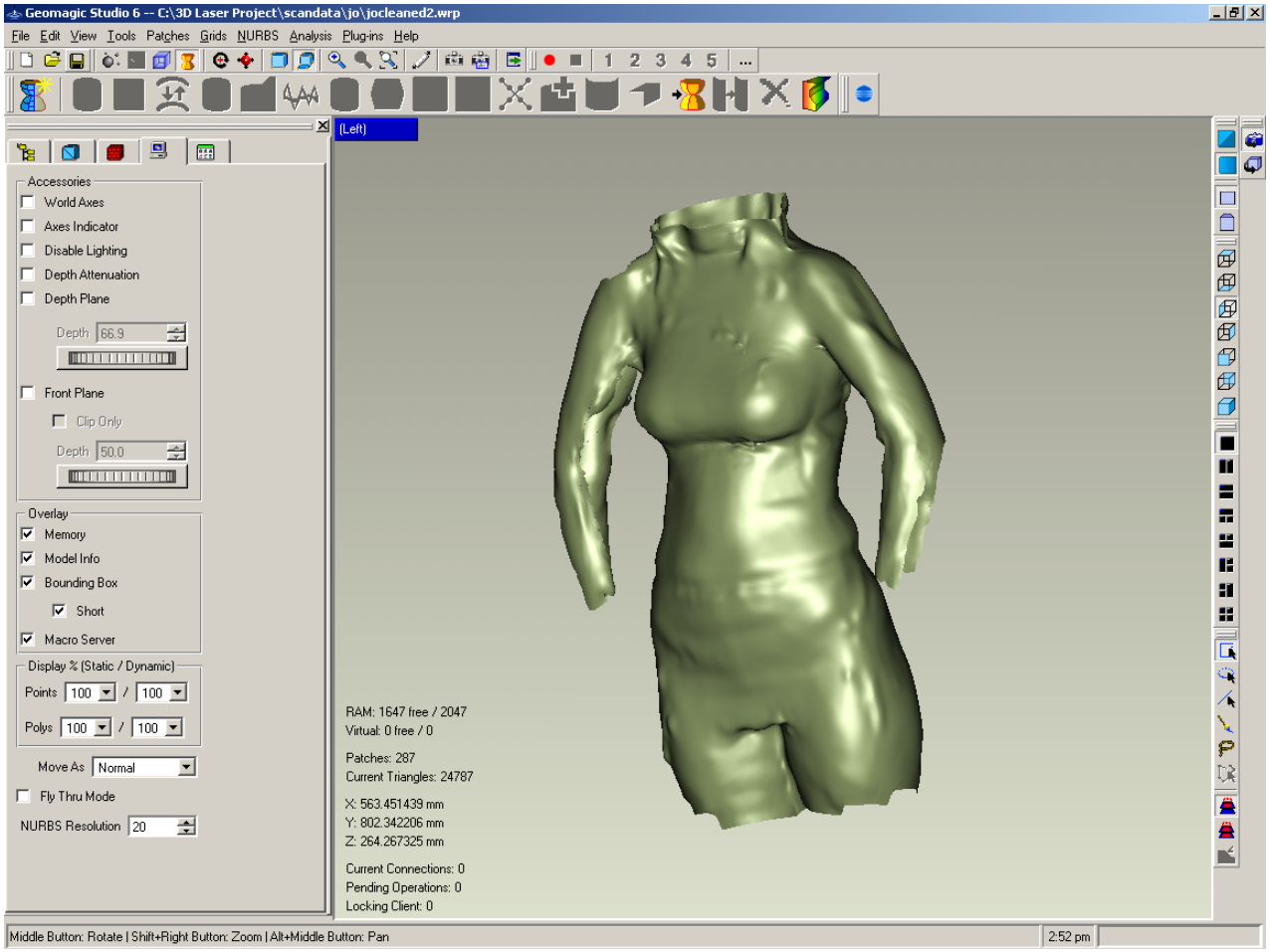
# Merge points



# Flexible export in 18 file formats



# 3D body model completed.



# Recording:

# Results of experiment(s)

- New methods for 3D practice in Fashion/Textiles BA & MA
- Transparency of Process
- Accuracy of data
- Ethics:
- Body catharsis awareness
- Avatar/ virtual body surface data
- 3D data for wearable fit and functionality